The Province of Alberta

IN THE MATTER OF "THE NATURAL GAS UTILITIES ACT"

—and—

IN THE MATTER OF an Enquiry into Scheme to be adopted for Gathering, Processing and Transmission of Natural Gas in Turner Valley

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G. M. BLACKSTOCK, Esq., K.C., *Chairman*

Dr. E. H. BOOMER, F.C.I.C., *Commissioner*

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WITNESSES

E X H I B I T S

March 21st, 1945,
9.30 A.M.

S. J. Davies,
Exam. Resumed by Mr. Fenerty.

Q Now Mr. Davies, I believe that you have prepared a report on the Turner Valley natural gas production and reserves?

A Yes Sir.

Q And perhaps I had better put in the report at the beginning and I will get you to read the report and make any comments you may desire.

REPORT OF S. J. DAVIES REFERRED TO NOW MARKED EXHIBIT 40.

Will you tell us the methods you employed in making your computation of the reserves ?

A Yes sir, in selecting a method of estimating the natural gas reserves in Turner Valley I was desirous of determining three things. First, the amount of the reserves. Secondly, the rate at which those reserves were likely to be withdrawn in each year, and, third, the point at which the peak load factor would become the dominant factor. It was equally unsound to take the production for 1944 of 41.3 billion feet and divide it into the total reserves and conclude that you have a very short life time as it is to take the average figure of consumption for instance and divide it into the total reserves and have a much longer life time. It is necessary to take the amount of gas likely to be withdrawn in each year and you see then the picture in its proper perspective showing the amount used each year, arriving at a balance which may be stored or wasted and your reserves gradually become less and less each year. It is quite true to say that natural gas will be produced

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from Turner Valley for many many years in the future, but in very small amounts because the situation of that field is simply that it is declining and time is one of the very important factors in recovering natural gas from Turner Valley. You must allow a sufficient length of time due to permeability, the most important factor, because it will only come out of there at a very slow rate. With that in view then I used the decline method, not that I think there is anything wrong with the other methods at all. They are excellent I think but for the purposes of this report and in order to give all the information, not only to the Board, but also to the City Council, I endeavoured to get all the information I could into one report.

Q All right, now perhaps I think we will come to your report Mr. Davies.

A May I read this sir.

REPORT ON TURNER VALLEY NATURAL GAS PRODUCTION AND RESERVES.
FEBRUARY, 1945.

INTRODUCTION

The producing area of Turner Valley is located in Tp. 18, 19, 20 and 21, Rge. 2, 3, W 5th Meridian. It covers an area of between 24,000 and 25,000 acres.

Some years ago Dr. Link and myself did a great deal of work for the Royalite Oil Company trying to determine where that gas cap divided from the crude oil area and we arrived at an opinion that it was at minus 2,000 feet and that gave an area to the gas cap of 7448 acres and some 17,000 acres likely to the crude oil area.

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It is divided into two main parts, a gas cap, where wells produce natural gas and small amounts of a very light gravity naphtha; and a crude oil area in which crude oil is brought to the surface by the natural gas.

Q MR. FENERTY: Just before you proceed this might be a good time to bring it out. I am interested in the relative volumes of operation as between crude oil on the one hand and marketable natural gas on the other. Have you given any consideration as to the comparative figures of production in values between those two operations ?

A Yes sir.

Q Perhaps you might give them to us now ?

A This document is in as an Exhibit. December publication of the Conservation Board. In the year 1944 - this is reading from page 3 - production of crude oil at 8,340,540 barrels. Of this amount 8,279,180 barrels was sold for the sum of $13,600,473. The natural gas contains natural gasoline and the sale of natural gasoline during 1944 amounted to $867,588. Now this right here leads to the question of value at the well head. Of that crude oil, the value was at the well head and I also think that this gasoline if we took 20 percent of $867,588 would be a fair valuation of the natural gasoline at the well head.

MR. CHAMBERS: I have no particular objection to this evidence, but I was wondering whether this was an appropriate time to lead this evidence. I have in mind the question of cross examination. Are we going to be

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called upon to direct our attention to that at this stage which deals purely with the question of reserves ?

MR. FENERTY: I want to get from the witness one thing only, and I do not know where it would come in and that is that these relative figures without going into details, discrepancies between relative values of production used would apply in a greater degree if this was over the period of years preceding. This.is all I wanted to bring out because of his knowledge of this situation.

MR. CHAMBERS: It is understood this witness will be available again.

MR. FENERTY: But I do not know what part this will come into it to tell the truth.

MR. CHAMBERS: I think I have an idea why you are leading it.

MR. FENERTY: I would like to bring it out now before I forget it.

Q Be as brief as possible because it is not strictly the actual amount of gas in the field. You have given us some figures on the natural gasoline and oil and have you there the figures as to that particular year, the amount of gas sold for consumption purposes ?

A I have it in part and I have the figures from a compilation including the figures in here of some 15 billion feet sold.

Q Now then you are familiar with the situation with respect to sales of oil and gas as disclosed in the report and gasoline. Are you in a position to give

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us any comments as to how those respective values compare in preceding years, not year by year, but rather I should say the discrepancy between value of oil and natural gasoline on the one hand and gas sold on the other, would be equal, greater or less in the preceding years to 1944 ?

A No question at all but the value of oil sales and the natural gasoline sales way out-weigh the natural gas sales by ten to one or even more.

Q Would that be true throughout the life of this field ?

A Oh yes.

Q That is just the point I wanted to get at. All right we will go on without further interruption from me.

A The Turner Valley field has characteristics of its own. One is that the crude oil wells change to gas wells as they become older, and a second is that the water drive from the deep west side of the structure is a very slow one.

NATURE OF PRODUCING FORMATION:

Two Horizons of porous limestone make it difficult to arrive at a calculation of pore space in the formation, as the porosity of these limestone bands varies rapidly from well to well, and even within the drainage area of one well. The limestone lies at depths of from 3200 feet to over 9000 feet in a fault block steeply dipping to the west.

AREAS IN TURNER VALLEY:

Turner Valley was divided into British American Area; Gas & Oil Products Area; Madison No. 3 Compressor Station Area; Madison No. 1 Compressor

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Station Crude Oil Area, and Royalite Gas Cap Area.

In each area the production for each well has been calculated so that the reserves available to any branch gathering line can readily be found, and related to the cost of gathering the natural gas.

CONSERVATION BOARD RECORDS:

Throughout this study the production data of the Conservation Board has been used, and every courtesy and assistance was given by the Board and its employees.

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THE WITNESS: I would like to add here that I think that is a most excellent organization. It is a most valuable aid to anybody working in this Province.

CALCULATION OF ALLOWABLES:

It has been the policy of the Conservation Board to allow some wells so much gas per month, and other wells so much oil per month. As gas/oil ratios in Turner Valley are in general always rising, any system based on two different mediums of calculating allowables results in unequal treatment of producers, and overproduction of natural gas has resulted.

The calculations shown in the attached sheets have been made on the basis of the natural gas allowables as set by the Conservation Board, and will of course only be valid if allowables in the future aremade on that basis.

For example, during the years 1945, 1946 and 1947 it has been estimated that natural gas production from all areas, except the Royalite Gas Cap, would amount to 32, 28.8 and 25.6 billion cubic feet respectively. These figures will be exceeded unless all wells are placed on a natural gas allowable basis.

CAPACITY TO PRODUCE:

I notice that Dr. Katz uses the term "ability to produce." I actually get the term "capacity to produce" from Mr. McCutcheon which I thought was a very good term.

I think it is equally good to use the term "ability to produce".

It is considered that each well in Turner Valley has a capacity to produce so much gas and oil in 1945 and subsequent years, and that capacity is declining as shown on the attached sheets. Some 20 wells have already reached the stage where they are unable to produce 25 barrels per acre per day. More wells will be added to this list each year, and the day will come when only a few wells will be able to produce 25 barrels per acre per day.

Right here I would like to add that the Brown allowable is not the law of the Medes and the Persians and it is an arbitrary allowable, and fluid withdrawal from the formation, and the wells themselves may be declining at a rate which will be greater than the calculation made by the Brown allowable. I would feel that ti be true from the number of wells that are now unable to produce 25 barrels per acre per day and the number that are nearing that stage, as if the wells were open to full production for six months' period I feel that they could not make 25 barrels per acre per day. This point becomes extremely important when you speak of the future and being able to go and direct 40 barrels per acre per day or 30 barrels per acre per day. Actually you get to the stage where the decline in itself puts a restriction on how much oil and gas you will get out of the wells rather than the Brown allowable, and this is not a criticism of the Brown allowable which I think was an excellent thing. I think it was

a very excellent thing and fitted in very excellently into the situation which existed and still exists in some of the more productive wells, but as the wells become older they reach a point where they cannot produce 25 barrels per acre per day, therefore, the Brown allowable does not mean anything.

It is not known how many wells in the Royalite Gas Cap cannot produce the allowable at 1 January, 1945, but Dalhousie No.6 and Royalite No. 24, are mentioned as examples. All wells in the field, no matter where located, should have an annual test to determine whether the allowable can be produced. Otherwise a very false impression of the capacity of the field to produce is built up.

METHOD OF CALCULATION OF RESERVES:

In order to estimate the future annual production of natural gas, a complete study was made during the past eight months, of the production records of Turner Valley wells. The history of these wells up until the middle of 1942 is of interest as examples of what the wells will do under various stages of uncontrolled production. Since 1942 the Brown plan of withdrawal of 25 barrels per acre per day has been in force.

The production records under this plan should be a guide to future behaviour of the wells. I should add there under that plan, and therefore a series of calculations was made based on the monthly production record of each well in Turner Valley from October 1942 to June 1944.

I did not start in June 1942 because I thought there would be some period there in which the wells would be required to settle down to the new conditions and I, therefore, took the average for the last three months of 1942, and it is the first column in these series of sheets.

Q Which page is that?

A That is Page 16. I then took the average of the wells for 1943 and the average for the first six months of 1944, and the June and July average production for 1944 gives me four points on a curve. Now I think it would be equally well if I plotted each point on the curve, but I was after certain mathematical results and , being one human being, while Mr. Connell did what I thought was a terrific piece of work, but I had not the time to do all the work he did, so that I arrived mathematically by figuring out the average decline that was present, and that was a matter of 21 months, that period over which I took it. It was actually a little bit more but I was anxious to get what I thought was a fair figure, and I figured out then the decline over all in the period and then the decline per year. Then for each year I figured out what that production would be from each well in the year. Now that is the average production for the year based upon the average for June and July of '44. Some months in the middle of the year, for instance July,had no production in some of these wells and others produced the odd month. You will find errors in here for

that reason. So that when I did not have any information I took the allowable, and that is where I ran across this question of some wells being on gas allowables and some wells on oil allowables. That made it very difficult in some of the wells to decide what the gas decline would be, but where it came to the question that I could not decide I took the average decline of the wells in the surrounding area or the wells in the immediate area.

There are a few cases here where you find that the gas/oil ratios are dropping, and they are wells on the extreme Western edge, and, of course, the fluid production I show can be partly water, but I am not able to say when they go to water, and the only thing I know is that the gas/oil ratios are dropping. There are a number of wells here that show it when you look through it. This is a very large piece of calculting but when I got through with it all I was able to take any section of land and decide fairly accurately how much gas would be available for any pipe line at any given period in the future. From that you can then decide whether it is an economical proposition or whether it is not.

MR. McDONAld: May I interrupt, the exhibit I have does not contain the tables that the witness is reading from.

WITNESS: Well, we turned in ten copies of the tables.

THE CHAIRMAN: Didn't you get two copies, Mr. McDonald?

MR.McDONALD: No sir, I only got one copy of this particular document. I did not object to this up to this point but from now on I do want it. Dr. Katz has kindly loaned me his copy now.

THE WITNESS: Now in order to bring these monthly average figures to annual figures, it is necessary to multiply them by twelve. Now I came to a point in this where normally the wells should be cut off and later on in the report I go into the reasons why, but I cut them off when the gas production reached 10 barrels per month as far as the crude was concerned, - I am sorry, - the oil production reached 10 barrels per month and the gas production reached 100 MCFs a month, 100 MCFs per month down to practically nil revenue. I tried cutting them off at a higher point but I was not able to gauge the point, the financial point, I did not know and do not know now. It depends to some extent upon the decisions of the Board as to what that point would be, and only the Board will be in a position to judge. I cannot judge. So I put it all in and then in figuring out the total reserves, for all these various questions, such as liquid loading and abandonment for lack of revenue and so on, I took off 10% at the end.

Now so much for the method, which is just a straight decline method on the well production as shown by the Conservation Board over

the period from October 1942 until June 1944. Now, at the back of this, after making all those calculations that I did, of the various areas, I brought them all together in this summary. First of all taking it as to the Royalite Gas Cap,

Q MR. FENERTY: Found at?

A Page 42.

Q MR. HARVIE: Did you say 42 or 43?

A 42 in this copy.

THE CHAIRMAN: The Court Reporters tell us the copy they have has not got the schedules.

MR. FENERTY: I did not look after the filing of these.

THE CHAIRMAN: Ten were filed and ten went out and I suggested to Mr. Bailey that surely the City of Calgary had enough stenographic help to prepare the schedules, and I think they should be furnished. Others have furnished us with complete copies and I think the Counsel should have complete copies of your exhibit as well.

MR. FENERTY: I will inquire about that.

WITNESS: I prepared these and perhaps I should say that these sheets here are too big to go into an ordinary machine. It takes a big wide typewriter and there are only three typewriters of that nature in Calgary. I bought one in order to do that. Now that can be done but there was no decision made as to exactly putting these in until a very late date as you are aware.

Q How many complete copies were filed?

A Well, I filed 10, 2 full copies and 8 without the schedules. However, if you want them typed, I will start and have some more typed but it will take some time because, as I say, it has to be typed. You could get about six more copies or at the maximum 7. Or if you need two typings, it should be decided now.

THE CHAIRMAN: We will leave it for the moment.

MR. BLANCHARD: I will let the Board have the copy that Dr. Katz has been using, at the end of this Chapter, for filing as the Exhibit in place of the one that is filed.

THE CHAIRMAN: All right.

Q MR. FENERTY: How much further comment have you got to make on your calculations?

A It all goes back to the sheet at the back and that is page 43. It should be page 43.

Q You will not have to read that in full. You will be commenting on that and that will have to be taken down anyway.

A Everybody has copies of page 43. It is page 43 in this report and I think page 17 or page 16 in the copy that Mr. McDonald has.

Q Now let us have your comment on that summary.

A The column "Monthly Gas Production" shows the average production in each year of natural gas. This is the year 1945, 2.67 billion per month. The next column shows the "Daily Natural Gas Production" average production, which is 89 million feet for the year 1945. Now I have given the oil production so that I can get

the value of the oil produced by this amount of gas in each month and that is 576,000 barrels, the annual gas production for 1945 is 32 billion cubic feet of gas. Annual oil production 6.9 million barrels. Going to year 1946, due to the drilling of new wells, the decline works out at 10.1 per cent and the amount estimated to be produced is 2.4 billion feet per month. Daily gas production, 80 million feet; monthly oil production, 452 thousand-odd barrels. Annual gas production, 28.8 billion cubic feet and a total annual oil production of 5.4 million barrels, and a decline of 10.1 per cent.

Q MR. HARVIE: Has that application to both oil and gas decline or just gas decline?

A That is just the gas decline which is estimated. As you will note, the oil decline is much greater. All these figures are in terms of wet gas. I will not go on further unless it is necessary because it is just a repetition all the way across the page to the year 1960. Now in order to arrive at the quantity of gas that will be produced by the Royalite gas cap, and we use that gas cap reserve solely for the purpose of making up the peak loads, and I get a figure of 834,450 mcf. beginning in 1946, per day, and out of that figure later on in my report I will come to it, I give 60 per cent of that figure as being available. Dr. Katz used, I think, 10 per cent, but he took his reserves down to 250 pounds and I took my reserves down to exhaustion. Therefore I took off a higher percentage. I have taken off 40 per cent and that of course includes deductions in the absorption plant

and the scrubbing plant and so on, all deductions. Therefore for the year, we will say 1946, I have 48 million feet a day from the crude oil area for the B.A. and G.O.P. plants. Where do I get it? I get it from the second line, 80 million feet a day and 60 per cent of 80 million feet, that is six times 8 that is 48.

Q MR. CHAMBERS: Where is that?

A That is on page 43.

Q MR. BLANCHARD: Is that a figure, that 48, is that 48 used in any separate table?

A No, I am reading it off here now. It is in the body of the report. 60 per cent was given as the remainable portion, and the balance to make up the peak load is the difference between the 48 million feet a day. This is wet gas. I am sorry in this case it is dry gas but when you come to produce it out of the gas cap, you have to produce it as wet gas, so I have arrived at what would be the difference I have to come at from the Royalite gas cap and in the year 1946 I figure on it as 1.66 billion. That is shown in the next line all the way across the page on page 43. Now it is somewhat arbitrary but generally speaking there is a decline of about 10 per cent per year and an increased amount drawn from the Royalite gas cap being 10 per cent a year. They are not necessarily comparable but that is just an estimate. It is the best I could do under the conditions. It is one of the factors that has to be evaluated. I carried on with that calculation till I reached the year 1954 and I find that the full allow-

able of the Royalite gas cap is being used and then there is an increased withdrawal from the Royalite gas cap, where I provide for the drilling of 6 more wells in the Royalite gas cap to provide the necessary volume to supply the peak load. Then I declined that Royalite gas cap 6 per cent per year which should be the minimum I could find as a rate of decline in the gas cap wells. There are wells in the gas cap that decline at a more rapid rate than that, but I took the minimum. I did not decline them at all on the Royalite gas cap wells for the period 1944 to 1954, although some 37 billion feet will be withdrawn, a little better. Now that brings me to the point that in not declining them I am not aware of how the Royalite proposes to operate those gas cap wells. It could be that in order to withdraw this load from the Royalite gas cap that they would withdraw from Foothills 1 at the North end and Royalite 26 and Royalite 27 at the extreme North end and from Lowry 7 and Commonwealth down hear Mayland, the Gas and Oil Products' plant in the South end and that re-pressuring would take place in the Royalite 17 area. If that were true, it seems like the sensible way of going at it. Then you could have the peak load drawn from the further portions of the gas cap and the repressuring done close at hand to the No. 1 compressor station. In which event there is bound to be some decline in the Royalite gas cap which will again affect the ability to produce a large volume of gas for peak load purposes when the crude oil area becomes par-

tially exhausted. When I reach the year 1960, I come to a point where I do not have enough gas to supply the total volume required. One method is to increase the Brown allowable. I have already mentioned that the Brown allowable might at that time not have any great ability to be increased. I am not aware of what those wells will do in the way of the capacity for each well for the year 1960. It could be some wells will have an increased capacity but it is my own opinion that a great number of them will have less capacity than shown on the Brown plan, and that they will have declined on the lines that I have indicated. Now you can drill more wells and get more gas for that peak load period. Then of course the question of costs comes in because undoubtedly under the Public Utilities the drilling would go on and the costs and that might not be feasible. It might be far better to drill in some other place than the Public Utilities. The other point is that if you cannot get a large additional volume of gas for the cold months in the winter, we come to a point where our peak load problem becomes the dominant problem.

(Go to page 973)

Now I have not tried to lay down any one year or anything like that because I do not think it is possible. It is between a period of years and will depend on, as much as anything, on the weather; that is one factor. The second factor, and the most important one, will be the consumption at that time.

Now when I reach the year 1960 there are very few wells left in the crude areas that have not been exhausted. There are some and I have taken the 5 billion feet from the B.A., the last column, 1960, and it is down, the fourth line, 5.1 billion in 1960 as the production in that year from the S.O.P., B.A., gas cap and the whole of the crude area, I take that and add it to the production from the gas cap in that year and I get 12.02 billion feet total.

Then I go to the 1961 and I add the two areas together and treat them all as gas caps; in other words, that only gas would be produced for use and not for any other purpose because the oil production is so small that it is not a question of it being produced for market and then I decline the average of the two together on to the year 1976.

Now gas will be produced in Turner Valley long after 1976 but again that time factor comes in and the quantities are small each year and the cost of course is a matter that is another question all together.

Now I want to go to the Turner Valley natural gas balance sheet where I bring these all

together, both the production from all areas, and that is the second period of calculation across the face, and it is all on a wet gas basis, production 32.9 billion for the year 1945. I estimate 4.32 would be stored and that storage figure is arrived at by taking the average consumption in the summer months and the surplus being available for storage and that again is an estimate. Some years it will be higher than the 4.32 and some years lower, and that is a wet gas figure.

The net production, the difference between the gross production and what is stored and the consumption I have given therethe estimate made by, the same estimate that Mr. Ralph Davis gave to the Gas Company and the consumption for the field, of which I am familar, added them together, bringing them to a wet gas basis by multiplying by 1.2, that is because I used the figure of 17% for the reduction. Dr. Katz used 15% but on my basis of 17% it brings the dry gas figure up to the wet gas figure for comparison in this calculation. I put in fuel for drilling wells in the next three years, and then I had a balance over and that I put down as wastage.

Now I carry that on throughout the period and I arrive at certain totals and the totals are dealt with in the later pages in my report and if I deal with them now when I am on the subject it will tie them together.

Total production of wet gas from all crude areas and the G.O.P. and B.A. gas caps 237 billion feet. Crude 28.9 million barrels, which is

less the amount which we should deduct for the earlier period and taking them out to exhaustion, and I have estimated this at 10%, which brings it back to roughly 26 million barrels crude oil. Gas cap during this first 16 years 93.4 billion feet, making a total of 330.9 billion feet of gas. Of that total I estimate 211.4 billion will be used, consumed; that 32.9 will be stored. Now some of that in storage will be used during that period. I have allowed 3½ billion feet for field drilling purposes and I arrive at the total over-all figure of 83.3 billion feet as wastage in that period and from 1961 on I have estimated the production at 108 billion feet, largely, overwhelmingly, from the Royalite gas cap of course, which gives a total over-all figure of 428 billion feet.

Q MR. FENERTY: Now you have not made any allowance for wastage from 1961 on?

A No, because I estimated and assumed that the gas would be produced entirely for use as used.

Q In your calculations when the oil production ceases you will not have any wastage of gas?

A I do not think so. I think the wastage of gas arises from the fact that you are producing crude oil.

Q All right. Then with that explanation, we will go to your report and just where did we stop?

A "Method of calculation of reserves", and perhaps if I read this now it will make more sense;

METHOD OF CALCULATION OF RESERVES:

In order to estimate the future annual production of natural gas, a complete study was made during the past eight months, of the production records of

Turner Valley wells. The history of these wells up until the middle of 1942 is of interest as examples of what the wells will do under various stages of uncontrolled production. Since 1942 the Brown plan of withdrawal of 25 barrels per acre per day has been in force.

The production records under this plan should be a guide to future behavior of the wells, and therefore a series of calculations was made based on the monthly production record of each well in Turner Valley from October 1942 to June 1944.

The plan was to endeavor to find out the rate of decline of each well. The amount of production from each well each year in the future until exhaustion was then estimated by calculating the future annual production by multiplying the average monthly production by 12. June-July average production for 1944 was taken as a starting point in most wells.

The actual annual decline in percentage was used to arrive at the probable production in each year. The daily production for all areas, except Royalite Gas Cap wells has been shown. This figure is the average for the year, or the mid year figure. The average daily production in each area each year, may be calculated by dividing the monthly gas total production by 30.

This is a well tried method of calculating future reserves, and has been selected by the writer as being the safest to follow in Turner Valley.

In general then the situation in Turner Valley may be summed up as follows: All crude oil wells, and B.A. and G.O.P. gas cap wells are to be produced at

25 or less barrels per acre per day for some years in the future, and the results of that production in terms of wet gas, and before any deductions, is shown on the Summary of all areas at the end of this Report.

DEDUCTIONS FROM WET GAS FIGURES:

In all cases 3% has been deducted for lease use, and 14% for absorption and scrubbing plant use. There is no reason why both B.A. and G.O.P. plants should not operate on the same basis as Royalite.

Many wells are not connected to the gathering system and others are intermittent producers, due to blowing down the wells, and stop cocking methods of production. Other wells operate at too low pressures to enter the gathering system.

EXHAUSTION OF PRODUCTION AND ABANDONMENT:

All wells have been kept on production until exhaustion simply because the point of economic operation was not known, and it also varies between the owner of one well, and the owner of several wells. Many wells will be abandoned long before they are exhausted. An example of this is Okalta No. 7 abandoned in December, 1944. The reasons for abandoning wells may be water encroachment from the west side, liquid loading of the wells in both the crude oil and gas cap areas, desire to use casing elsewhere, or simply too small income to pay royalties and operating expenses on the revenue received. With 350 wells at the end of their lifetime, many causes may bring abandonment before exhaustion.

CONSUMPTION:

The following table as supplied by the Canadian Western Natural Gas, Light, Heat & Power Company, and other consumers, was used as the basis for estimating consumption:

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CONSUMPTION DATA (DRY GAS BASIS)

YEAR	Canadian Western	Alberta Nitrogen	Imperial Refinery	Refinery G.O.P.	Valley Gas and Others	Total
1945	10640000	3500000	1800000	900000	409000	17249000
1946	9500000	1750000	1800000	900000	409000	14349000
1947	8500000		1800000	900000	409000	11609000
1948	7580000		1800000	900000	409000	10689000
1949	7580000		1800000	500000	409000	10289000
1950	7580000		1800000	500000	409000	10289000
1951	7660000		1800000	500000	409000	10369000
1952	7740000		1800000		409000	9949000
1953	7820000		1800000		409000	9949000
1954	7900000		1800000		309000	10009000
1955	7980000		1800000		309000	10089000
1956	8060000		1800000		309000	10169000
1957	8140000		1800000		309000	10249000
1958	8220000		1800000		309000	10329000
1959	8300000		1800000		209000	10319800
1960	8380000		1800000		209000	10389000

The above estimate of future consumption is based upon present price schedule for natural gas. The G.O.P. Refinery uses unscrubbed natural gas located adjacent to the G.O.P. Absorption Plant in Turner Valley. The Nitrogen Plant may not operate after 1946, depending among other factors, on the price to be paid for natural gas.

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Q MR. FENERTY: I think perhaps we will not have to read that now as the matter of consumption will come up at a later date, so that we might skip that for the moment. (see above)

MR. HARVIE: I think there is an error in my copy of that table, it likely is a typographical error,

on the 9th line.

MR. FENERTY: Yes, the column is put out.

MR. HARVIE: No, I think it should be "10949", should it not?

THE WITNESS: Perhaps I can correct it afterwards, Mr. Harvie.

MR. HARVIE: All right.

STORAGE OF NATURAL GAS:

A figure of 4.3 billion cubic feet wet gas basis is shown each year for six years, and a diminishing amount for 4 more years, a total of 32.9 billion cubic feet available for storage during summer months in Bow Island, Royalite Gas Cap and B.A.Areas.

In order that this question can be viewed in its proper perspective, it will be necessary to examine the location of this stored gas.

STORED GAS -B.A. AREA:

In the B.A. area stored gas may be delivered in the winter, and stored during the summer. Present information is that the capacity of the 8 inch line from B.A. Absorption Plant will not be fully used as sufficient gas is not available from B.A. and G.O.P. plants to fill it. That also applies to future years. Also on a very cold day, B.A. and G.O.P have insufficient line capacity to supply their share of the peak load, if they could, and the Royalite Gas Cap will have to be drawn on to make up the difference.

During winter months then, gas stored in Summer may be used to fill the line to capacity, and supply as much as possible of the peak load.

The net result of this policy is that little gas can be accumulated in the B.A. area. The amount stored in summer will be used in Winter, and in a very short time even this plan will leave the 8 inch line operating at less then its capacity.

In view of the consumption of gas at the G.O.P. Refinery, and the annual decline in production, it is unlikely that much gas will be available from this source for Calgary consumers. This will add to the problem of peak load in winter, all of which must be taken care of by Royalite Gas Cap Wells.

STORED GAS -ROYALITE AREA:

The gas stored in the Royalite 17 area at Turner Valley will be available for peak load demands on an hourly or daily basis. The gas stored at Bow Island must also be available for daily peak load demands.

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PRESENT DAILY PEAK LOAD 85 MILLION CU.FT.DRY GAS:

The present peak load capacity from Turner Valley amounts to between 80 and 85 million cu. ft. per day of dry gas. This means 102 million cu. ft. of wet gas per day on Royalite plant basis.

I think everyone is familiar with what we mean by the capacity. It is the size of those pipe lines and their pressures at No. 1 plant to deliver gas in one day. It is between those figures. The balance has been coming from Foremost.

When the crude oil wells have declined to say 5 million cu. ft. per day of dry gas, and the balance of peak load of say 70 million cu. ft. per day of dry gas must come from Royalite Gas Cap wells And I arrive at that figure because before the war we had 65 million feet of a peak load in this system and from the best information we can get we might go down to something like, on our domestic consumption, of 20 percent above that and I took 75 million feet a day instead of 65 as a peak load if consumption goes down to the extent estimated and I will have more to say as to that when we come to consumption.

...it will be necessary to examine carefully the whole question of whether Turner Valley aided by Bow Island and Foremost can be relied upon as the main source of supply for the Gas Company System. In winter with temperatures of zero for a month at a time it is the expensive part of our system in withdrawing gas. That is a factor that causes trouble. We have not had any forty below zero weather sustaining

this winter.

LIQUID LOADING OF WELLS:

At present gas cap wells produce small amounts of liquid, and this amount has been increasing slowly in recent years.

I want to say I am interested in a gas cap well. During 1944 it produced some 500 barrels of discoloured naphtha in the gas cap. That is a very small amount, but it is a very difficult thing to handle as I am learning. It is there. It is not its value, it is the difficulty in getting rid of it.

The Gas Cap is therefore not a dry gas field, and calculations made on that basis must provide for liquid loading of wells. How far this liquid affects the volume of the reservoir is not known. However as pressures in the gas cap decline, it is certain from the observed effect upon the Gas Cap wells today, that at least two factors must be allowed for, first the gas volume from the wells is sharply cut at low pressures, and secondly wells shut off at much higher pressures than in a dry gas field.

If oil wells in the crude oil area are unable to produce gas when bottom hole pressures reach 250#, then wells in the gas cap area may be unable to produce any natural gas when their bottom hole pressure reaches 100# or even at a higher pressure.

It is definite even at 530# closed in pressure, that wells in the gas cap are affected by liquid loading, and within a few weeks of blowing them, production can be reduced to one-third normal,

and will shut off entirely unless the liquid is removed from the wells.

All this has a direct relationship to the problem of peak load supply for the Gas Company System when bottom hole pressures in the Royalite Gas Cap reaches 150# or less.

I have not tried to evaluate it because it is a factor that must be taken into consideration and I do not think anybody can at this stage say definitely, yes it will produce, or no it won't produce, and I point out that the factor is there as a fact and it is a factor that must be taken into account.

Q I wonder if we should go into this at the moment ?.

THE CHAIRMAN: Well there is another issue to be dealt with on that.

A The consumption of gas next.

THE CHAIRMAN: The present estimated future market demand is the next.

MR. FENERTY: Yes it is there for anybody to read and if anybody wants to examine on it, but for the moment I think I will go to the next item of natural gas being produced to lift crude oil.

A NATURAL GAS BEING PRODUCED TO LIFT CRUDE OIL:

As natural gas is going to be produced to lift crude oil and operate B. A. and G. O. P. sbsorption plants in any event, it is desirable that as many large consumers as possible be kept as customers during the next few years. The domestic consumption alone of the Gas Company system cannot be expected to carry all the charges at present rates. Any

large increase in rates would result in a sharp cut in consumption.

Therefore it would appear wise to use as much gas for fuel as possible, and retain all the industrial consumers. This means present low industrial rates.

Upon this basis it has been estimated that if a very cold winter developed between 1957 and 1960, the Royalite Gas Cap wells plus such gas as may be available from the then remaining crude oil wells, would not be able to supply the peak load.

DRILLING OF NEW WELLS IN GAS CAP:

Six new wells have been included in the Royalite Gas Cap to be drilled in 1955 and 1956 in order to maintain peak load capacity to produce. Even with the drilling of these new wells, before 1960 it will be necessary to have an additional source of supply to Turner Valley.

Once Turner Valley reaches the stage where peak loads cannot be supplied, then the whole problem changes. Turner Valley might from then on only supply 50% of the Calgary consumption, and Turner Valley might become entirely a peak load supply. No one can decide such matters in 1945.

ROYALTIES GAS CAP:

This area has been used as a means of supplying peak load requirements.

It is estimated that the withdrawal of gas from the Royalite Gas Cap will gradually increase each year, and that 854 MCF. will be produced in the year 1945.

I might say that is different now, because I prepared those calculations away back commencing last August and the installation has not been completed as fast as anticipated and therefore much more gas will be withdrawn from the Royalite Gas Cap in the year 1945 than I estimated.

DR. BOOMER: This is net withdrawal you are talking about ?

A That is a gross withdrawal. All those figures, I have not subtracted them all.

Q 854 is the estimate of what will be taken out of the Gas Cap ?

A There will be more put in. But that is a different story. I have taken this as a gross withdrawal.

This amount is already too small from the information available from 1945 operations.

Q MR. STEER: Is that figure on Page 11, 854 MCF right ?

A It is the same figure as appears on Page 43. It should be 834. You are quite right Mr. Steer.

Q 834 thousand it says. Do you mean 834 million ?

A 834. I am sorry if I have that wrong. It is 834, eight tenths of a billion, 834 million. On Page 11, 854 should be 834 million. Thank you very much.

THE CHAIRMAN: MCF ?

A Yes thank you.

It is considered that the Royalite Gas Cap wells will follow the same general behavior of B.A. or G.O.P. gas cap wells, and decline in capacity when they are produced.

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It is estimated that by the year 1954 full allowable production will be taken from the Royalite Gas Cap. Due to the amount of natural gas in storage in Royalite 17 Area, Royalite Gas Cap wells have not been declined until the year 1955, as the amount withdrawn has been spread over a long period of time. After 1955 these wells have been declined at a rate of 6% per year. Should however the rate of withdrawal of natural gas exceed 25 bbls. per acre per day, then the rate of decline will sharply rise, and the peak load capacity will fall off very rapidly. Liquid loading will be a factor at this stage.

LIFETIME OF RESERVES RELATED TO PRICE OF NATURAL GAS:

It is considered that the lifetime of natural gas reserves is linked to the price of natural gas to the Gas Company.

If the price of natural gas is raised to say 10¢ per MCF. at Turner Valley from 7 3/4¢, the consumption will fall, and the revenue might not greatly exceed the amount available from the sale of 10 billion cu. ft. of gas at 7 3/4¢ per MCF.

On the other hand reserves would last much longer if consumption was 7 3/4 billion cu. ft. a year instead of 10 billion a year.

Now this deals with the competition of coal.

MR. FENERTY: Unless you think it is linked up definitely with the lifetime of the Valley.

THE CHAIRMAN: It may be difficult to separate them.

COMPETITION OF COAL:

A Owners of blocks, hotels and large buildings can heat them with coal in competition with gas. Edmonton was an example of this a few years ago when gas was sold at slightly higher prices, and customers turned to coal. During 1944, Edmonton used 7.0 billion cu. ft. with rates much the same as those now in force in Calgary.

The larger industrial consumers are not interested in an expensive natural gas supply, because they can turn to automatic stokers and coal. Refiners can turn to fuel oil.

No scheme of Turner Valley conservation can compel an industrial consumer to purchase natural gas, when a cheaper fuel is available.

LIFETIME OF TURNER VALLEY:

The question of how far the Board's plan increases the lifetime of Turner Valley has been carefully considered. It is considered that after the year when peak loads must be secured elsewhere, the only advantage is that a larger percentage of the total annual consumption of natural gas will be available each year from Turner Valley.

And right here I want to say that once we have to provide funds to bring gas from some place that might not be an advantage at all. It might or might not. It is not possible to say at this time that it is a distinct advantage.

For example more wells will be available to draw from, and Turner Valley might supply 90% of the

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load in 1960, where without the Board's plan, Turner Valley could only supply 80% of the load.

How far has the Board's plan delayed the peak load problem?

Which I think myself is the key to the whole problem at the present time.

That will depend upon the annual natural gas production allowed by the Conservation Board. This Board has the power to restrict natural gas production from 41.3 billion cu. ft. as in 1944, to 30 billion cu. ft. in 1945, and 25 billion cu. ft. in 1946, and to prevent any wastage of natural gas.

This would conserve far more gas than any plan yet proposed. If this is done, then the Natural Gas Utilities Board's plan will have delayed the peak load problem by 4 or 5 years.

THE CHAIRMAN: Pardon me, is that 4 or 5 years from now ?

A Oh no, it adds to or pushes it on into the future.

If the price of natural gas is raised to a point where industrial consumers turn to other fuels, then the peak load problem is solved for perhaps 10 years or more, but at the cost of a sharp drop in consumption, and as a result, a sharp rise in rates to the domestic consumers.

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SUMMARY:

The Summary of production and Natural Gas Balance Sheet shows the results of the tabulations. 331 billion cubic feet will be produced by 1960. Of this amount 211 billion cubic feet will be used by consumers to 1960, the Nitrogen Plant consumption during 1945, and part of 1946 has been also included in this figure.

33 billion cubic feet will be stored in the B.A. area, Royalite 17 area,and Bow Island. Of this amount that portion stored in the B.A. Area will be used by the year 1960,as there will be very little profit in operating the B.A. Absorption Plant after 1954, when the daily gas flow to that plant will be less than 6 million cubic feet per day.

If the Nitrogen Plant continues to operate, more gas will be drawn for peak loads from the Royalite Gas Cap than would otherwise be the case. Less gas will be left in storage by 1960.

The amount of gas available for use up to 1960 is therefore, wet gas consumption 211 billion cubic feet and an additional 61 billion cubic feet stored and conserved gas in the Royalite Gas Cap.

Assuming that after 1960 no gas will be produced except as consumed, 108 billion cubic feet of wet gas will be available up to 1976.

The dry gas reserve of Turner Valley at 1 January 1945 is therefore 83% of 272 plus 108 or 315 billion

cubic feet, and there should be brackets around 272 plus 108.

Another way of calculating the dry gas reserve up to the year 1976, will give a slightly different figure, but the method may be easier to follow.

Up to 1960, crude wells, G.O.P. and B.A. gas cap wells, are to be produced not to supply the market demand for gas, but to produce crude oil and gas to B.A. and G.O.P. absorption plants. From the Summary it will be noted that the production from crude oil areas, plus G.O.P. and B.A., Gas Cap areas up to 1960 amounts to 237.5 billion cubic feet. It is estimated that 60% of this amount will be available for consumers either by way of direct consumption, or through storage. 60% of 237.5 equals 142.5 billion cubic feet. Again from the summary it is estimated that 93.4 billion cubic feet will be produced from the Royalite Gas Cap up to 1960. Of this amount 83% should be available for consumption or 77.5 billion cubic feet.

I was trying to arrive at a figure which could be used when your peak load factor becomes dominant and you have to consider another source of supply.

The total dry gas then to 1960 is estimated at 142.5 plus 77.5 which equals 220 billion cubic feet. From 1960 to 1976 83% of the 108 billion which may be produced from all areas, equals 89.6 billion cubic feet. The total dry gas figure to 1976 then amounts to 509.6 billion cubic feet.

Q Mr.Davies, I think perhaps you have covered all the points that you have had in mind in reference to gas reserves in the Turner Valley.

A That is all, sir.

THE CHAIRMAN: Mr. Steer?

MR. STEER: No questions, Sir.

THE CHAIRMAN: Mr. McDonald?

MR. McDONALD: I have some.

THE CHAIRMAN: I do not know, Mr. McDonald, I think we will adjourn for five minutes, or so.

MR. McDONALD: Yes sir.

THE CHAIRMAN: Just for about five minutes.

(The Board at this juncture took a short adjournment).

CROSS-EXAMINATION BY MR. McDONALD.

Q Mr. Davies, if you will refer to page 2 of your report, in the last paragraph you referred to the production from 1945, '46 and '47 for all areas except the Royalite gas cap will amount to 32, 28.8 and 25.6 billion cubic feet respectively. Now, can you give me the limits of the other areas?

A Give you which?

Q The limits of what is the B.A. area and what is the G.O.P. area?

A Oh yes. The B.A. area is all the wells connected to the B.A. system in Township 18, except the top tier of sections, two sections, 32 and 33 across the top. The G.O.P. runs from the B.A. area and includes all those wells attached to the G.O.P. gathering system,

and it is mixed in with the Royalite No. 3 compressor station, and as the Royalite put in a map I saw no point in my putting in another one. It has the same information on there and it shows the gathering lines very clearly, it has the wells on the gathering lines. And then the No. 1 compressor station runs up to North Sheep River, not quite - sorry, did I say No. 1? It is No. 3 compressor station runs up to North Sheep River, and the No. 1 compressor station, all those wells delivering to the No. 1 compressor station from the crude oil area.

Q And you add the following sentence "These figures will be exceeded unless all wells are placed on a natural gas allowable basis.

A Yes sir.

Q Now during your examination in chief, you referred from oil basis to a natural gas basis. Would you elaborate on that?

A Well, some wells I find are given so much oil each month to produce, so much oil each month. The calculation is a perfectly fair and valid calculation, and is based on the gas/oil ratios of the last recorded month and the last recorded by hole pressure which might be back some distance, and that is given on the 15th of the month, from the 15th to the 15th of each month. Now, gas/oil ratios are rising in the field, and as gas/oil ratios rise, that number of barrels produces more gas than it would if the producer had been given the gas because he gets

barrels of oil to produce, not cubic feet of gas. Now, how much does it amount to? Well, it amounts to more than you think. And a great number of wells, a big majority of wells, are on gas allowables, overwhelming group or number, and there was quite a few when I came to work this out, I found month after month after month had a rising amount of gas every month and I could not understand it. Each month they would have more gas. So I went back to the Conservation Board and I said "How could this happen?" and they said "Oh, we just caught up with that well recently and that is what we found, that they had over-produced so much." And it was all on the record. It was quite reasonable and above-board. But it does mean this, if all wells are on an oil allowable, then you have not got control of the natural gas production. Now I was estimating how much gas would be produced in 1945, '46 and '47, and it makes a difference. In other words, taking a figure of something under 40 billion cubic feet and the allowables, gas allowables, and multiplying it out each month for '44, and something under 40 billion feet would have been produced, and actually 41 to 43 billion cubic feet has been produced, that is how it arises.

Q Your suggestion then, as I understand it, is that it would give the well say 15 million cubic feet a month and then the oil production would be the oil produced from that allowable of gas?

A Yes, that is right. Everybody would be the same. That is my suggestion. And then I think my figures

can be uniform figures throughout to counteract that.

Q That only applies, of course, to the crude oil wells?

A That is right.

Q That would be applying the Brown plan more on a gas basis than on its oil allowables?

A That is right.

Q You recommend that?

A Yes, I think it is a little fairer. Yes sir.

Q It is a lot fairer to the producer or the field as a whole?

A Yes sir. Take two producers, one on the gas and the other on the crude allowable, and they are side by side, it is absolutely fair to both of them to put them on the same basis. I think as the field is overwhelmingly on the gas allowable, the gas allowable figure should be enforced.

Q There would also be more control by the Conservation Board?

A No doubt about it, in my opinion. I am not trying to tell the Conservation Board their business. It is just my impression after studying these figures in great detail.

DR. BOOMER: I think,Mr. Davies, that they have not got very much choice.

MR. McDONALD: On page 3, Mr.Davies, of your report, you referred to capacity as declining and you referred to 20 wells that have already reached the stage where they are unable to produce 25 barrels per acre per day. Have you tabulated the names of them?

A No, I have not. I have got a number from the Conservation Board. I think I probably could. I do not know whether I have them all here, but I can give you some of them anyway that have difficulty in making 25 barrels, but I have not got a tabulation of 20 wells to hand in.

Q Well what are the characteristics of these wells that do not reach the 25 barrels?

A They are small wells.

Q They are small wells?

A Yes, or oil wells that were good once and declined very rapidly, two types of wells. We will take Spy Hill was always small. The West Flank wells that come into the picture now but they decline very rapidly. National Petroleum 2 was a small well but it declined again quite rapidly. Royalite 32 declined very fast. It has a relationship to the permeability of the formation.

Q The wells you have mentioned were all what we call in the field "tight wells"?

A Tight wells, and some of them were small producers. Some of them were large producers when they started but they went down fast.

Q They are mostly situated in one area of the field?

A No, they are scattered right straight through and even there is one Home well in the picture. I do not remember the name, but I think I can give it to you, or the number. It was always a small well. I think it is Home-Millarville 11.

Q Well Mr. Davies I am interested because I was under the impression from some of the other evidence we have had here that by increasing the basis of the Brown plan from 25 barrels of reservoir fluid per acre per day to 30 or 35 would give us more gas. It would accelerate gas production. Do you agree with that theory?

A Well I was quite well aware of the pressures and so on and it was for that reason I made these statements, sir. In the year 1945 and from that date on to each subsequent year as the pressures go down - I am not an expert on the calculations of the Brown plan, Dr. Katz is right there and he is the expert and I think he could explain this better than I can - but I can at least give you the effect of his calculations perhaps as well as he can. The effect is that as pressures go down of course the 25 barrels per acre becomes nearer and nearer and nearer the capacity of the well to produce and eventually the 25 barrels, according to my calculations, passes the point or crosses the period of the capacity of the well to produce. If I am not correct in that interpretation, Dr. Katz is right there and can correct me.

Q So that there would be, with the same number of wells and increasing the basis of the Brown allowable, it would result in greater production of gas?

A There are quite a few wells in the crude area that it definitely would help and quite a few wells in the gas cap area, but as your pressures go down the

number of wells becomes less until you get to 1960. Dr. Katz gave it as his opinion that during the next four or five years we should look at the picture and I quite agree that is a good thing. When we come to the year 1960, there is no need for the Brown plan because you have a natural restriction because the capacity of those wells to produce as at that time would drop below 25 barrels per acre per day.

Q At the present time, Mr. Davies, a crude wells' 25 barrels per acre per day is related to 40 acres?

A Quite generally I think that is the case.

Q That is the maximum, there may be one or more exceptions, but as a rule . . . . .

A Take in the gas cap for instance . . . . .

Q I am speaking of the crude wells.

A Very well, sir.

Q As regards the gas cap that is right, but so far as the crude, the acreage is more.

A Yes.

Q The assigned acreage is more?

A There are some 120 acres or more.

Q Have you any, can you tell me in regard to the number of gas cap wells that now produce their 25 barrels?

A I can give you an example or 2 examples. I happen to be particularly interested in Dalhousie No. 6.

Q Yes.

A I was here at the time that Dalhousie No. 6 was drilled and I was here when the Royalite No. 4 was drilled and if you look at the production record for those two wells, you have some idea of what their productive capacity is, including some idea

of their capacity to produce and the quantities allotted to them under this formula. It illustrates, sir, the point that the Brown plan is an arbitrary allottment. It does not say a well can produce it. It is not designed to say that a well must produce 25 barrels per acre per day when it has not got the capacity to produce it. There is those two wells' production and there may be more because it is very hard to tell whon the reservoir wells are shut in and restricted and I am trying hard - I have been here quite a few years and I know that these gas cap wells to my knowledge the Royalite have been restricted since the year 1934.

Q If in the case of any of these wells the allowable is based on 80 or 120 acres it would not affect their capacity?

A It would not make any difference because they could not do it anyway. But I have been asked to give some method to be devised to get their sharing position right. If you have wells in there and you are not going to depreciate them and you are going to give them a part of the revenue, if they cannot produce the amount allotted to them under the allowable basis the answer is not right. It is not particularly my concern but you have asked me the question and that is the answer.

Q There may be gas cap wells which may produce more than 25 barrels per acre per day?

A There are.

Q In estimating the capacity to produce would you give those wells additional acreage, 80 acres,

120 acres, 160 acres?

A That is another question. I do not quite understand why you would want to give them more.

Q In dealing with the capacity to produce, have you related it to acreage?

A No. I have related it to the volumes produced by those wells.

Q Now in dealing with the gas cap, and we have heard of a drop in production from the gas cap, have you checked that acreage at all?

A No.

Q Purely . . . . .

A Except I added 6 more wells in there to help out the peak load capacity and if you would like to know where I located them, it will be of some interest. In section 23 in the North end and section 24, I put 4 wells. I put 2 wells in section 30, in the Dalhousie No. 7 area. I have reason to refer to that Dalhousie 7 with considerable interest.

Q That will be 4 in section 23.:

A And ? in section 30.

Q That will be in township 19?

A In township 19.

Q How about the B. A. and G.O.P. areas?

A I did not put any in there. They are deeper wells and I know something about that area. You could not possibly drill a well in there and get your money back.

Q Now turning to page 4, Mr. Davies, and page 5. At the bottom of the page, you say :"In all cases, 3 per

cent has been deducted for lease use and 14 per cent for absorption and scrubbing plants' use." Do you think 3 per cent for lease use is adequate?

A That is very difficult, Mr. McDonald, to say. In the gas cap area 2½ per cent - I went to the records and looked at the records and it looks as though 2½ per cent would be ample. If you take a group of wells, the same as Royalite wells have been able to group them, 2½ per cent is too much and the basis that Mr. Stevens-Guille has used of 10 mcf is quite in order. Then when you come to a lone well where the oil must be heated then you have too little even at 3 per cent and that is why my report - Mr. Ralph Davis, he gets 4 per cent on that basis. So that you have to take them and average them all over the field. It is quite an arbitrary average, 3 per cent. I would like to say, Mr. McDonald, there is an awful lot of gas used in the field for many many different reasons and it is very wasteful use. I put down 3 per cent as what I thought it should be and not what it is.

Q The tendency will be I suggest, Mr. Davies, that as this gas attains a value in itself it will be less economic to use it in the field and everywhere else and that will be a retarding influence on the waste-fulness.

A I can answer that question Mr. McDonald if my answer to it is perhaps put this way. There is 41.3 billion feet produced in the year 1944. If you put a value of 2 cents on that, you would have 826 thousand dollars.

The amount sold, the wet gas - that is wet gas at the well-head - the amount sold is about 16½ billion, which would be 330 thousand dollars and there is another billion and a half that is used up in the form of gasoline in the absorption plant. That is the wet gas portion of the gas. The difference between the 330 thousand dollars and the 826 thousand dollars was used in the field by somebody. Now somebody had the use of that gas and if there is a value to it, why I leave the answer, that is the answer right there.

Q Now, on the point about the gas used in other conditions, have you made an estimate of that?

A Yes, I used a figure of 60 per cent and the 40 per cent includes 17 per cent used in absorption plants, 3 per cent . . . . . 14 per cent used in absorption plants, 3 per cent for lease fuel, 10 per cent for abandonment and gas line flow, such as not being able to get into the line intermittently, all those factors come into it. I am not able specifically to take 3 hundred and something wells and come any nearer than making an estimate on it.

Q Now in your estimate of 14 per cent for absorption and scrubbing plant use, does that include fuel for them?

A Yes, I got that figure from the Royalite operations last Fall.

Q As I recollect, Dr. Katz and Mr. Davis, in regard to this British American plant, allowed an additional 8 per cent approximately for fuel and a similar amount in the G. O. P. plant.

A I am here representing the City of Calgary which is an indirect way of representing the consumers. We are one of the parties that will be called upon to pay for the amount of gas used. It is my view that if we consumers must pay, all other parties must also pay for the gas that they use.

Q So that the additional gas produced above your 14 per cent you think should come into a sharing position in the market somewhere?

A Most decidedly.

Q Now with regard to the wells that are not connected to the gathering system, have you listed the wells that you had in mind there?

A Yes, I have. In this document you will find in all cases after the name a "C" or "N.C." That is as at November 1st, 1944.

Q What page are you referring to?

A That is on all of these sheets, throughout the sheets. You will find a "C" for connected and "N.C." for those not connected as at 1st. November, 1944. At the end of each group, take Royalite No. 1 Compressor Station, page 41.

THE CHAIRMAN: It is not on these.

A I am sorry about that. We started to type this list last September and that is how that came to be left out. I find that these C's and N.C.'s are not on all of the copies. Some of them were typed before I had the information. But I think that the summary is on all copies. That is on page 38, November 1st, 1944.

Q MR. McDONALD: The copy that I have has the

markings on it.

A Yes, there are some. I think everyone has the summary at the bottom as at November 1st, 1944. Crude wells connected, 73 per cent; Crude wells not connected, 27 per cent. Wells not yet drilled, 21 billion feet estimated.

Q That is on page . . . .

A That is on page 38 of my copy and on page 39 of Dr. Boomer's copy. And that is true of all of these areas as of that date. Some wells have been connected since that time and Madison could give you that information.

(Go to page1004)

Q On page 5 you deal with "Abandonment", Mr. Davies; now there is a provision under the Petroleum and Natural Gas Conservation Act with regard to abandonment, is there not?

A Yes.

Q It must be permitted?

A Yes.

Q And there is also a provision for taking over wells for the use of the field on some compensatory basis?

A Under this act?

Q Under the --

THE CHAIRMAN: Not under this act.

Q MR. MCDONALD: No, the Oil and Gas Conservation Act?

A Well Mr. McDonald, it may be. I have been away four years, as you know, and there may be something, there may have been something passed during that time.

Q I am just suggesting to you as long as the wells are capable of producing something which is required for the market they will not be abandoned?

A Well I would like to answer that in this way and say that I am interested in a well which has 436 thousand cubic feet per day allowable; the average of all these wells in the field is just over 300 thousand cubic feet per day, all of them. Last year 1944 the well I referred to had a revenue of 23 hundred and something dollars, I can give you those figures exactly because I have them here and there is no guessing at it, if I may look at them.

(MR. FENERTY here hands Witness document)

There was $1063.92 from crude oil sales and that was $2.12 a barrel; absorption gasoline sales of $1325.06, making a total $2388.98, that is the

gross revenue. Royalties were $322.48, that is 13½ percent, and I might point out many oil wells have a great deal more than that. The total expenses for all purposes $830.25. The difference was $1236.25 which was the gross profit. Now that was for the year 1944.

Q Mr. Davies, before you go on, is the gas from that well sold, sold for fuel?

A No, oh no, that is sales of crude oil and absorption gasoline.

Q There is no sale of gas for fuel or for heating purposes or for any other thing?

A There is a few dollars in there through the B.A. distribution but it is extremely small, and I want to point out that is an extremely wet gas well. There is over double the quantity of natural gasoline in that well than there is in any of the more westerly wells, that is a wet gas well, using the term as having more gasoline in it than some other wells, and if you go over and take a well that has a production of 100,000 a day, 100,000 cubic feet per day, and it is not a particularly wet gas you will get to a point that unless the tax payers bonus the operation, it becomes entirely uneconomic and most assuredly you can not put gas prices up high enough to ever keep those wells in operation.

Q That is after the income from crude oil or absorption gasoline, crude and gasoline, is not sufficient to pay the actual operating expenses, then it will be abandoned?

A I cannot see anybody being forced, I know of nothing, to force an owner to produce a well when there is no revenue to pay the expenses.

Q The only recourse then is to keep your operating expenses down so low?

A That is right, and then abandon the well.

Q Now about the desire to use casing elsewhere from most of these wells in Turner Valley, do you think that is an element in the picture?

A It is in the gas cap.

Q It is in regard to the old fashioned wells?

A Well there are 96, - perhaps not all that number but a great number, there are 96 gas cap wells and a great number of those were drilled with cable tools, or with several strings of casings, and they are the only ones affected.

Q The other wells were drilled with rotary equipment and the strings of casing are not recoverable?

A I do not think so. I would like to point out there, that the bulk of the supply in the later years, I think on all estimates, comes from the gas cap wells. They are the ones you are depending on.

Q Yes. Now on page 6, Mr. Davies, you deal with the storage of natural gas; how did you arrive at that figure of 4.3 billion cubic feet, and did you divide it between the North end storage and the South end or the B.A. storage?

A Well it is a bit complicated and the more you learn of it the more complicated it becomes because it is related to the consumption of natural gas.

Perhaps if I outline it and then you will see whether it specifically needs to be answered or not.

If the Nitrogen Plant was to remain on in the summer time it takes some 10 billion cubic

feet a day, off-peak consumption. Right away it affects the amount which can go into storage because you do not have to provide compressers for the quantity which is going to be used and in the paragraph which I did not read here, dealing with consumption, 45% of our load is an industrial load and it depends upon low rates to keep it and if we lose part of that industrial load, it is the load that is steady in the summer time. I have assumed that we can keep it, that we can keep this low rate for the industrial comsumers and we can keep these industrial consumers as the bulk producing money to handle this whole situation and on that basis, I then worked out what the summer consumption would be on the same percentage as used by Ralph Davis in his report where he gave you 15% for January and on down the scale. Then I took the figures in my last page, The Turner Valley balance sheet, and I figured out how much would be the average consumption each day in the year because they were being produced every day in the year, these wells, and the difference between the average daily production, taking 60% of it, and the average daily consumption is the quantity that is left to go into storage. That is how it is arrived at and it is true whether you are in the B.A. area or whether you are in the Royalite area.

Q Did you appropriate it between the two areas?

A I think, I have 12 billion feet, there-abouts, for the B.A. area and 20 billion for the, - or a little shade over 20 billion feet for the Royalite area. Now some of the Royalite area might go to Bow Island.

Q Yes.

A And it would be very good business if that was done.

Q Now you say that the net result of this storage operation is that very little gas will accumulate in the B.A. area over the years?

A Well that is up to the B.A. in part but there is the pipe line there. Now let me explain that, it is complicated again, on the day that we produce 80 billion feet if the sharing position of the B.A. was 20%, they would be entitled to sell 16 billion cubic feet. Well there is no 16 billion cubic feet from that Plant available to sell if you are going to put in G.O.P. gas into that same line because I think the capacity of the line at present temperature or winter operating temperatures might limit you to 17 or 18 million cubic feet, something along there and it would depend how cold the weather was and how much heating you would have to do on that gas. Now the B.A. would be losing part of their market if they did not sell it that day but yet they are entitled to that share. Now that is right now, in the year 1945.

If we go on to the year 1948 when the peak load might be nearly the same thing and the sharing might be still 20% and the quantity available to be delivered is not any 16 billion cubic feet a day but they could only deliver 8 billion cubic feet a day, now we have a lot of gas in storage, that they put in storage in the summer time and it is my opinion that it is always good business, and you need that gas on peak loads, that you will find the peak load becomes the dominant factor as I mentioned, one of the three factors,

and the time when you will need that is on cold days and that is the explanation for it.

Q If I get you right, Mr. Davies, the gas storage in the B.A. area then may finds its market very quickly?

A I would think so.

Q In short periods?

A It might find it, it might be very good business to fill that line full on peek load periods.

Q Yes?

A And it is for that purpose storage gas will have to be taken into consideration or else you have to abandon the allowable principle and draw more on wet gas and I thought if I brought this matter up in my report before the Board for their consideration.

Q Now dealing with the Royalite 17 area?

A Yes.

Q What do you say as to the term of storage which may enure there?

A I think I have explained that by saying it depends how the Royalite operates their gas cap and I of course have no knowledge whatever of that.

Q Yes, as I recollect the withdrawal from the gas cap under the alloweble through either end - ?

A If they want to get gasoline out of that absorption plant nd they draw wet gas from the outlying wells, they of course should decline quickly and the higher pressure area should build up around the Royalite 17 area because there is miles between them, there is some 18 miles over the over-all strip, very close to it.

Q Now referring to your page 43, Mr. Davies, you did give us

the dates on which you thought the Royalite gas cap would come on what we would call "Full Production"?

A Yes, it is 1954.

Q 1954?

A You will see there it shows the allowable.

Q Yes, so that commencing in 1955 then, the actual allowable would be withdrawn?

A And I put in new wells to be drilled and that booststhis up to 8.34 in 1955 and 8.8 in 1956. The idea was more wells would give you bigger capacity and a bigger allowable.

Q When your allowable is exceeded or is to be exceeded, the repressured gas will go to the market?

A Then the repressured gas, you will need the repressured gas.

Q But will you need the repressured gas on a daily basis even before that?

A You could, yes.

Q You could?

A Yes, you could indeed. It is most convenient to have a high pressure group of wells that you could draw on when you get to this point where your peak load becomes the dominant factor.

Q So that in your opinion it may be before 1954 that you would have to draw on the Royalite gas cap, would have to draw on the storage gas, before then?

A I am not sure, it would depend entirely on how they operate.

Mr. S. J. Davies,
Cross-Exam. by Mr. McDonald.

Q I am assuming that no gas cap well will be operated at more than its allowable on any day ?

A Oh that is quite right Mr. McDonald, that is true. Then you will get to a point between 1956 and 58 where they will have to draw on the stored gas at Bow Island and Foremost if you are going to stick to your allowables straight.

Q I am going to suggest that you should in order to make your reserves come out in the life of your field you must stick to your allowables and this repressured gas will be required to take care of your peak loads ?

A Well it is at the very best a very weak crutch.

Q But it is still there to be available ?

A Oh yes, the purpose is excellent. The amount is small.

Q And it is essential as you say ?

A It is a valuable aid.

Q There is just one thing that has occurred to me in regard to this and it is in the line from the south end to the scrubbing plant, can the capacity of that line be increased by operating the power of the compressors - the amount of the pressure ?

A Raising the pressures ?

Q Yes.

A Putting it through at higher compression.

Q Yes.

A Well it is solely a matter of how much it is going to cost.

Q When you speak of 18 million a day do you suppose it could be made more than that ?

A Oh yes it could be made more than that if you are going

to put more compressors in there but I hope you do not ask the consumers to pay for it.

Q But I had in mind that there is an eight hundred pound compressor already in service. I was thinking it could be stepped up ?

A Well then the Madison #3 would also have to buy one to get in line. They both come into the same line at Hartell. That is the point, and they are dependent upon their mutual operation of those two different plants.

Q Well I am informed that they have handled as much as 24 million a day through that line.

A Perhaps so.

Q And I do not know whether that included the gas coming in to the Hartell junction or not ?

A I do not know either, but the question will be will 24 million be available in '48. My own judgment is it won't be without you use stored gas.

Q Then there is -

MR. HARVIE: What year did you say, 1948 ?

A 1948, yes, and of course each year on from that year, Mr. Harvie, it will get more difficult to meet that peak load when you use stored gas.

Q MR. McDONALD: Mr. Davies, you referred to liquid loading of wells ?

A Yes, sir.

Q On Page 8. Now can you tell us something of the characteristics of the gas cap wells and liquid loading. Can you blow off those ?

A I tried this summer with one well just to see what would happen by leaving it go six weeks, and it cut the

production down to one third of normal and dropped the pressure at the top of the hole of course to a point where there was some considerable difficulty in getting it to unload. It took several days. In fact I carried the experiment just a little farther than it was sound. It finally did unload and I think if I had closed the well in altogether and left it some weeks it would have unloaded by lightening the column of gas in solution, but the amount of oil is small, but it accumulates and it is necessary to take it out periodically, and that is just simply an operating problem that exists. I do not know that I have the answer to it but it is there.

Q Well if there is provision made for blowing the well into the lime and in line with other wells at two weeks or something of that kind, it is not a large problem ?

A It is not at this pressure, but when you get down to a pressure of 200 pounds as this quantity of liquid has been slowly increasing, then you have got a problem because it might not lift it. That is my trouble. What happens when you get to the point where it does not lift it.

Q You are referring to gas cap wells ?

A Yes, right straight gas cap wells.

Q What pressure do you think the gas cap wells will be produced and still have gas available ?

A I do not quite agree with all the previous witnesses on that because the gas cap wells vary in depth and for instance a well that is 5400 feet, it is very little

different to a crude well, that is on the eastern or upper tier of crude wells as has been named here and wells of that nature might not produce when they reach a bottom hole pressure of 250 pounds. Another well like, we will say, Royalite #14 which is right on the top, I think it is 3220 feet to the top of the lime. A well like that you have very little liquid loading and might produce down to 60 pounds. It depends upon the location of the well on structure as I see it.

Q At Page 11 of your report, Mr. Davies, you refer to Turner Valley being the source of supply for peak loads in the event that it can only supply 50% ?

A Well that is involved with the question of, as you are aware, when you get down to a point Mr. McDonald, we will have to drill for further gas, there is money involved and somebody has to put it up and it does not grow on trees. It has to have a reasonable rate of return or people will not put it up. Now to pay that back and also carry the investment on in Turner Valley it might be found necessary to join the revenues that you would get off this system together to see whether you could provide the funds to get the money. I cannot name that division at the present time. I do not think anybody can.

Q I was going to suggest you might use Turner Valley as the steady source of supply and a new source of life for peak loads ?

A It might depend upon the prices in Turner Valley related to the price at some other place.

Q Not entirely the gas price but the cost of delivering

gas to the consumer.

A Well as you know pipe lines are built these days very rapidly, and are not what might be called the governing factor in public utilities work at this time.

Q It is the price in the field that may be the governing factor ?

A It might be and it is very definite here that we are heading towards where the prices in the field may be the all important factor.

Q On Page 13, Mr. Davies, in the middle of the page you say the Conservation Board. This Board has the power to restrict natural gas production. You mean the Petroleum and Natural Gas Board ?

A Yes.

Q Not the Natural Gas ?

A No I am referring to the Conservation Board.

Q Has power to restrict production from 41.3 billion cubic feet as in 1944 to 30 billion cubic feet in 1945 and 25 billion cubic feet in 1946. Would you just explain what you have in mind there ?

A Supposing we produce 40 billion cubic feet in 1945 - 6 - 7. Supposing that was the case, all my figures go out the window and everybody else's figures will be affected by the dissipation of this gas in a much shorter period than any of us have contemplated. If you go back and see the production in 1941 - 2 - 3 - 4 you have very large sums. I think 53, 46, 45, 43 and 41.3 billion in 1944. Well now one of the main ideas of this plan is shutting in the oil in gas cap which would reduce that amount down to something along the figures I suggested

and if they were reduced still more wastage could be reduced materially, but that is a matter not for me. It is a matter for Government policy.

Q You were not suggesting they should put in a new scheme of conservation and depart from the Brown Plan ?

A No the Brown Plan can easily be made 20 barrels an acre per day for the rest of 1945. It automatically does it right there. It is a matter of calculation.

Q Now then if gas is being returned to formation by the pressure and there is no net loss or gross loss then the Conservation Board may permit the gross production of more gas than say, 41 billion cubic feet ?

A Yes I think that is quite feasible,as far as I am concerned it makes no difference how many times you circulate this gas if you want to call it that. What you mean is that you take out from the gas cap not one million feet but five billion and you put back in four, your net withdrawal is one.

Q Yes.

A I think that in that calculation you should allow for the loss.

Q I think so, yes.

A Which was pointed out by Ralph Davis yesterday.

Q Allowing for any wastage or loss so far as the consumer is interested.

A I think the consumer is not interested if it helps to carry this load all to the good.

Q And similarly if the excess gas produced by the gas wells if kept on allowables and the gas is increased as you were pointing out in the first part of my

examination, if that gas is repressured that is saved in some part of the field it would be good business or it would be permitted ?

A I think it is entirely a matter for the producer. I think that the cost of gas, of this waste gas, is related to the production of crude oil and production of natural gasoline and that they are the people who should stand the expense and if they want to take out more oil and more gas is produced and put it back into the ground, I think that the consumer has not the slightest interest. That is perfectly all right so far as they are concerned, providing the producer pays for it. The only objection will arise if they ask the consumer to pay for it. That is a different story.

THE CHAIRMAN: After all we are getting into the old economic argument that we have had since the beginning of time and will it help us anything in relation to gas reserves. I think not. The consumer always pays.

MR. FENERTY: In this case it might be the consumer of oil of course.

A There are also consumers of gasoline, Mr. Chairman.

Q MR. McDONALD: Mr. Davies will you refer to Page 14.

THE CHAIRMAN: Have you much more ?

MR. McDONALD: Just this one question is all I have.

Q MR. McDONALD: Page 14, you have in the second last paragraph, "The amount of gas available for use up to 1960 is therefore wet gas consumption 211 billion

cubic feet and an additional 61 billion cubic feet stored and conserved gas in the Royalite gas cap."

A It is net production of the Royalite gas cap area plus the amount stored.

Q We take the 32 billion storage referred to ?

A That is right.

Q And the difference is conserved gas ?

A The difference is - there is a little alteration to that. In the Royalite gas there is only 20 billion and I estimated the 12 billion in the B. A. would be used by 1960.

Q So that the conserved gas in the Royalite gas cap is -

A Is 61 less 20, 41.20.

(At which time the hearing adjourned until 2 o'clock)

2 P.M. SESSION.

Q Mr.Davies, taking your estimate of reserves as a whole, do you think it is a conservative estimate?

A Yes, I think you would get that much gas all right. I do not think that there was any question about that.

Q That is all, thank you.

THE CHAIRMAN: Mr. Chambers?

.....

CROSS-EXAMINATION BY MR. CHAMBERS.

Q MR. CHAMBERS: Mr.Davies, in the case of the Royalite gas cap, instead of using individual wells in each instance, I understand that you in some cases used groups of wells in the gas cap?

A That is right.

Q And I take it the reason you adopted that procedure with respect to the Royalite gas cap was due to the fact that some of those wells are metered by groups?

A That is right.

Q Now dealing with the crude wells, I understand that some of those wells, and I give you an instance, the Northwest Hudson's Bay 2, actually showed an increase in the gas production rate?

A That is right.

Q Now just as matter of interest, how did you arrive at the decline rate in this instance?

A I took the average decline in that area. I think I mentioned that this morning.

Q Would you mind turning to page 10, the second last paragraph. Under what well head pressure do you base your assumption that Royalite gas cap wells could not supply the peak load from 1957?

A I did not base it on well head pressure.

Q "Upon this basis it has been estimated that if a very cold winter developed between 1957".....

A That is the amount ot consumption.

Q I see.

A If the consumption was a lot less, of course that is not true; if the consumption was a lot more, that is another factor, but taking those assumptions as to the amount of consumption which governs our peak load, that is what I mean.

Q I see. Now is it not true, Mr. Davies, that the ability to supply peak load demands as far as the gas cap is concerned would depend upon the differential between reservoir pressure and the gas gathering system?

A With no liquid in the formation whatsoever, that is true. The minute you put liquid in the formation, and there is liquid in those wells, then you have got another factor that has to be considered.

Q But even down there in those wells, one of the large factors would be the differential?

A Yes. It is not as simple as that, Mr. Chambers, because there is the size of the pipe lines and their extent. If you do not change them and they get older, and the line that comes from the Foothills No. 1 down to the plant, you might be able to use

some of the lines carrying crude gas, but if you are depending upon lines that are now operating at 350 pounds and get 200 pounds and still the same line, you have got another factor in there in regard to the size of the line to consider.

Q Now on page 12, just to have the matter on the record, I am not proposing to cross-examine Mr.Davies at this stage on the question of price or the economics; we reserve that until later. Now on page 13 you say that in 1960, which is fifteen years from now, that Turner Valley will probably only take care of 90% of the peak load. Now on what basis have you made that calculation?

A Well, that is declining the wells down to see whether or not there was sufficient gas by adding the daily production from all the crude wells, taking 60% of it, taking all the production I could contemplate getting out at that date from the gas cap, taking 83% of it, and seeing whether or not that would give sufficient for peak load of 75 million dry gas from Turner Valley.

Q What pressures did you assume at which the Madison system would then be operating?

A I did not assume pressures.

Q In other words, you came to the conclusion aside from the mechanical set-up?

A It is just a straight decline curve, declining the volume of the production.

Q And you did not take into consideration the mechanical

set-up of the gathering system?

A No. If the gas is not there to be produced it does not enter into it, no matter how many compressors you have got, you cannot meet the peak load. You have got to have the volume there to handle, and if the capacity of the wells drops off, well then that is the answer to that.

Q There was a short discussion this morning about the Dalhousie No.6 well. Do you know, Mr. Davies, that that well is not included in the gas cap allowable at all?

A No, and I did not include it, but it has been given an allowable and it is included in the Conservation Board's figures and they handed it to me. I know it is not connected.

Q My instructions are it has no lawful allowable?

A It has because I got the list of all the wells and it was given an allowable. Yet I knew what the situation was.

Q Now, Mr. Davies, yesterday I handed you some figures merely for the purpose of correlating your figures to some of the others?

A Yes.

Q I think you have that there and I wonder if you would follow these with me? Now, at page 15 of your report, you give 309.6 billion cubic feet of dry gas reserves as of January 1st, 1945?

A That is correct.

Q Now would you agree with the following break-down

of that figure? In the B.A. area wet gas 53,2 billion?

A That is right.

Q And taking the conversion factor of 60% you end up with the equivalent in dry gas of 31.9 billion?

A That is right.

Q And in the G.O.P. area the wet gas is 30.5 billion?

A That is right.

Q And applying the 60% factor you end up with 18.3 equivalent dry gas?

A That is right, sir.

Q And in the Madison area, the number 3 booster crude, 52.3?

A That is right, sir.

Q And converted on the 60% basis you end up with 31.4 dry gas equivalent?

A Yes sir.

Q And the No. 1 crude Madison station, 101.5 wet gas?

A Yes.

Q And converted on the 60% basis you end up with 60.9 billion dry gas equivalent, that is right?

A Yes.

Q And the gas cap to 1960?

A Yes.

Q 93.4 wet gas?

A Yes.

Q And that is converted on an 83% factor?

A Yes, and you ended up with 77.5 equivalent dry gas?

A That is right.

Q And in the gas cap after 1960, 198 billion wet gas?

A Yes sir.

Q And converted on 83% basis you end up with 89.6 dry gas?

A That is right, sir.

Q In other words, you have 438.9 billion cubic feet of wet gas converted to a dry gas equivalent of 309.6, that is right is it not?

A Yes, I think those figures are correct.

Q Now if we assume that 19 billion of wet gas was produced and marketed in 1944, your reserves as of January 1st, 1944, would have been 457.9 wet gas basis?

A Yes, sir.

Q And 325.6 on a dry gas basis?

A That is correct, sir.

Q Those are all the questions, thanks, Mr.Davies.

THE CHAIRMAN: Mr. Harvie?

MR. HARVIE: I have no questions, at this stage.

THE CHAIRMAN: Mr. Blanchard?

MR.BLANCHARD: I have only a few questions.

.....

CROSS-EXAMINATION BY MR. BLANCHARD

Q You have added something for new wells, Mr.Davies?

A Yes sir.

Q How many?

A I think 35 was the figure from October of 1944.

Q That is in the crude area?

A Yes, that is in the crude area, and six in the gas cap area.

Q And you decline those in the same way as the others?

A I took their initial production to be average production of the area in which they were going to be drilled, and then declined those as the average in that area.

Q Your declining in gas production is on a fairly constant percentage of decline, is it not?

A It works out very well.

Q Taking it all through, it works out to approximately what, about 11% a year?

A Oh it drops off to less than that, Mr. Blanchard.

Q That is in the crude oil area?

A In the crude oil area, yes. It starts off at 17% and when drilling ceases it rises to 12.9, I think.

Q And then drops off again?

A And then it gradually drops off until it ends up at 10.5 in 1960.

Q Mr. Davies, I note in your summary, I think at page 43, that your total wastage amounts to 83 billion 385 million cubic feet?

A Yes sir.

Q That is a lot of wastage?

A Well there is one figure in there that should be, 17% from the gas secured from the crude area, B.A., and G.O.P. areas, like for instance the gasoline taken out in the gasoline plant and the amount used in the gasoline plant and that is in that figure.

Q That is in that figure?

A Yes sir.

Q Would you mind breaking down your 40% that you gave us?

A 10% for the abandonment of the wells.

Q 10% for the abandonment of the wells?

A Yes. That is I took that out to exhaustion here, to very low figures, because I did not know at what point to leave them. Other witnesses have taken 250 pounds. Well that might be all right. I took them right out to see what the figure would look like, and then Itook off 10%. 10% of that is the figure I did not think would be produced, that will be left in the ground. And then there is the 17% which I previously described. 14% is for the plant use and 3% is for lease use. That gives me 83%. And I have got to add those up and that gives me 27%, and I have 13% left. Now 13% is those wells that are not connected. Those wells that are intermittent producers. For instance, I go to the Valley generally twice a week, and sometimes I will see twelve flares and sometimes I will see two flares intermittent producers blowing down wells or mechanical troubles with the wells.

Q They cannot be connected?

A They are not for that particular time connected into the gathering system. Now it is very difficult for me to say that that is so many million feet a year. At the end of the year from the Conservation Board's office I can get the figures, what they amount to,

but at this stage I have estimated for all those causes, and I have got 13% and that is a pure unadulterated estimate.

Q How much gas is being flared today in the Valley? Do you know?

A No, I cannot tell you right at this very minute. I have been in the habit of taking the Conservation Board's figures at the end of the month, and from that you get a very good idea. A rough guess would be 25 million feet a day.

Q Then is the unconnected gas included in your wastage figure?

A Yes, in the figure of 13%.

Q And your plant fuel?

A That is right.

Q And lease fuel is also taken into account?

A That is right.

Q As well as the flared gas?

A That is right.

Q The flaring of gas?

A Yes, that is right.

Q There is nothing said by you about migration. We were discussing it yesterday and you will remember Mr. Davis had something to say. What are your views on the extent of migration from the crude oil area to the gas cap?

A Well I was here at the time when wells were originally drilled in the crude oil area and, of course, I know that those pressures have been reduced by as much as

1000 pounds, and I see no other solution but to admit that that reduction in pressure was due to migration of gas from the marginal crude area into the gas cap area.

Q Do you mean in the edge wells only or do you bring it on down?

A There was a gradation down from 1000 pounds maximum down to virtually nothing. For instance, we considered it when we got the Home No. 2 well, but there had been no migration at all. Royalite 30 was another well I used which had pretty near what seemed to me the original pressure, but many of the other wells, when they came in, they had less than the calculated bottom hole pressure.

Q What I want to know is, do you anticipate that the pressure, the pressure in the gas cap during the period that it is not going to be produced to any extent, when it is being conserved for the next six years say, do you anticipate that there will be any great rise in pressure in the gas cap from migration?

A No sir. I think that the maximum migration took place in the earlier years, when there was.....

Q When there was a greater differential?

A When the differential was at the highest point. And then taking the pressure in the crude oil areas or the marginal crude wells on the gas cap, when they get down as they are now not far from the pressures in the gas cap itself, I think that migration just about ceases, as far as it being

any factor. I do not pay much attention to it.

Q Now I think Mr. McDonald referred to your remarks in your report on page 13, suggesting that the most economical way or method of conservation would be simply to reduce the gas produced from the oil area?

A Yes sir.

Q To get it down. That means that you would only use as much gas as required for market?

A But I did not go that far, because I only feel that, well, for instance, I feel that there is some unavoidable losses in producing crude oil. I do not think that you can produce those wells regularly day in and day out and every day, and have all the gas go into the gathering system. I think there is bound to be some loss.

Q I was under the impression that you thought that there would be greater cost to the consumer by adoption of a plan that has been put into effect rather then reducing the allowable production.

A Well, Mr.Blanchard, I think that this plan that has been adopted, with all due respect to everybody, is the most expensive plan from the consumers' point of view that I know of.

(Go to page 1030)

Q Well you would eventually have to put in all these low pressure gathering lines.

A No, Mr. Blanchard, it comes to a point where you go elsewhere. Then you would never take the gas.

Q You would never take the expensive gas?

A No, for a long time I tried to make out an estimate of the quantity of gas that we could have got out of Turner Valley at 7¾ cents under the old contract. There is my own figure I gave 309 billion and at least 80 per cent of that gas would have been supplied under the old contract at 7¾ cents. It is this additional 20 per cent that causes the headache to the Board and to the consumers and the oil industry and it is a very serious matter ih my view.

Q I am just wondering what additional cost there is going to be to the consumer ultimately except the cost of repressuring. Whatever additional cost is there?

A To the consumer?

Q Yes.

A Well I may be a little in advance of the question and that is the point where perhaps one gets into the real meat of the whole problem. It is simply this, we have as consumers to make provision for profits and meet the expenses and we have sums of money on which to provide for interest. There would be on the Public Utility principle as we know it in this Province we have to have, the consumer has to provide for so much money for the Gas Company in a price per m.c.f. and

so much money in consumption. Finally we come to the point where the consumer will pay a price per m.c.f. at the well-head which is an additional sum you must provide. So I roughly take this new set-up and there is an item for operating expense of as I see it at the moment some 450 thousand dollars.

Q That is over the whole system?

A That is over the whole system in Turner Valley. I do not think as representing the consumer that we can complain very much about wages or being inefficient or anything like that at the moment. I do not think it is very inefficient. So I have lumped the sums for wages. If the consumption is 10 billion feet per year, we pay a sum of 4½ cents. If the consumption drops to 7 billion feet a year then we have something like 6½ cents. Furthermore, the consumer is not free at any time to leave that and say that the price has got too high and we can go some place else. Not under Public Utility principles as I understand it. You are more or less tied to providing these sums of money. Then there is one other thing that we have not got a negotiable price situation such as we had in the previous situation of 7¾ cents. If we did not like to take the gas from the Gas Company, and if the Company set the price up to 15 cents, then we have to go to the Public Utilities Board to see whether we had or not.

Q If you are going to have insurance you want to pay for it, or expect to pay for it.

A Well, Mr. Blanchard, the point is not that but whether

or not we are in a position of compelling the consumer to buy gas. That is the whole point in this whole thing. We cannot do it.

Q THE CHAIRMAN: Don't you think that most people would pay twice the price to be able to use natural gas rather than to go back to coal?

A Well we all will. We individuals will probably pay the price but then we only represent about 4½ million feet in this set-up. That is all we represent in the market, but even although we paid twice the question is what will people like Imperial Refineries do. The minute you ask Imperial Refineries to pay twice the price, they go to other fuels. Burns & Company and other large establishments, they go to other fuels and the same with large apartment blocks. I know something about this personally. Take a block like the Noble Hotel or the Sherlock Block in Lethbridge. The Sherlock Block is burning coal right now because they can burn coal in the Sherlock Block cheaper than they can burn gas, even at present prices. So that those people are not worrying about insurance. They are worrying about the competitive price of other fuels.

Q What is to be gathered from all that. Is it to be gathered you do not approve . . . . Well perhaps we are getting into, or I have got into the question of economics and I did not intend to get into it. There is this that by this plan you are conserving or at least getting available to markets the gas reserves in the G.O.P. area and the gas reserves

in the British American area.

A Yes, sir, that is right.

Q That you would not have had if this scheme had not been put into effect?

A That is correct.

Q Do you consider that that is of any value to the City to have those additional reserves?

A I would say the answer to that is that definitely depends upon the price.

Q Depending upon the price?

A If the price is too high and if it puts up the price on all our gas, all that 80 per cent in order to get that additional supply, then I do not think the consumer will benefit.

Q Now we are coming to price again. Your idea about this is that conservation should have been effected by shutting off or reducing the production from the oil area wells instead of producing to the full allowable and repressuring the surplus.

A I think the fundamental method or the question of conservation is linked up with the question of crude oil and natural gasoline and that the solution - we will take any new field that comes in here, and the consumers have no connection with it at all but if conservation is to be effected, say the Shell well or any of those you like to select that that is gas which normally enters into the production of crude oil. I think we are dealing with the principle here that will go for a long time in this province.

Q Of course we have gone a long way for you to come

to the question that I was asking you. Perhaps you could not have understood it. If this gas in the South end of the Valley, let us say, - not in the North end where we are going to have extensions made in the North - but take the South end, if it is insurance to the City or if the gas is eventually going to be taken by the City, what greater cost will there be involved in putting this scheme into effect now than later on, putting in the installations to collect that gas. That is all.

A Well, I agree with Mr. Ralph Davis when I say that the fellow who buys that gas in the year 1965 is the fellow who should pay for it, not John Jones in the year 1945.

Q I see, all right.

THE CHAIRMAN: If that was applied to Municipal Debenture Debts it would be rather nasty, would it not?

A I am not an authority on Municipal Debenture debts whatsoever so I cannot even answer that question.

Q The principle you are enunciating is that let posterity look after itself while we look after ourselves in the meantime. That was the original basis on which Turner Valley was produced, wasn't it? Do not bother about posterity but let us get ours while we can.

A Well Turner Valley was originally produced as a gas field to produce natural gasoline or naphtha and they paid no attention whatever to the conservation of gas.

Q Or posterity?

A No. You could carry this principle right here, Mr. Chairman, to where you could put the price of gas to

where posterity is 60 years ahead of you. That is very easy to do. There is just a horse sense answer between those two. Some things are practicable and sensible but carry them too far and they become impracticable. I wonder if we are wise and time alone will provide that answer.

Q MR. BLANCHARD: Mr. Davis, in connection with this peak load problem, to what extent will Bow Island field reserve, the reserve in the Bow Island field relieve that peak load situation?

A It will be very helpful I think.

Q Up to what time will the Bow Island reserves be able to take care of this peak load situation, if at all?

A Well I do not really know.

Q Have you taken that into account?

A Yes, Both that and Foremost. They are two separate fields.

Q How much reserve is there in Bow Island?

A There is about 12 billion effective reserve. It got down to a point in 1924 where Bow Island had great difficulty even with Foremost to supply the market. And there is a lot of gas calculated to be left in the field. I think some 12 billion or 13 billion feet has been put back in and suppose you recover 10 billion of that, or perhaps not so much, we do not know. That rate of recovery might drop off fast after you start to use it. For a long time I thought one of the wise things to do would be to try out the Bow Island field and see what effect drawing gas from it would have on the actual drop in pressure in the

field. Until we have those figures it is anybody's guess as to the effect.

Q At present what you say is it would be a great help.

A Yes, I do not think there is any question that quite frankly, Mr. Blanchard, without the Foremost wells last year and this year the peak lead could not have been supplied.

Q That is correct?

A That is correct.

THE CHAIRMAN: Anything further?

MR. STEER: Might I ask Mr. Davies just one question? This reference you made to R. E. Davis and his statement that the man who was going to get the gas ought to pay for it.

A Yes.

Q As I understand both his statement and your own, you simply mean that there is no assurance in this scheme to date that it is the city of Calgary that is going to consume the gas that is stored.

A That is correct.

Q Am I right in that?

A You are quite right.

Q Is it your opinion that it will come sometime in the future that all the wells in this Turner Valley area will not be capable of producing 25 barrels per acre per day?

A Yes sir.

Q You referred to Royalite No. 14 and its capacity to produce down to 60 pounds pressure. We were not quite

clear as to where that pressure was measured in your test?.

A I would think at the surface.

Q Then what would you say would be the suction pressure required in the line at the well and at the compressor if that gas at 60 pounds at the surface was being fed into the line.

A 50 pounds. It is only a quarter of a mile from there to the No. 1 plant.

Q 50 pounds?

A Probably 50 pounds compressor. The volume you are going to get out of that, that is another story of course.

Q Yes, that is all.

Q MR. CHAMBERS: Mr. Davis, is it not a fact that in most large cities, say the size of Calgary or larger, that have no natural gas supply, it is common to find an artificial gas supply?

A That is right.

Q And the artificial gas supply in those cases is confined more or less to domestic use?

A Yes, and almost entirely in this climate to cooking.

Q Then let me suggest this to you that assuming the time should come that Turner Valley gas is only there available in sufficient quantities to take care of the domestic market, pure and simple, and assuming for the sake of my question there are no other supplies of natural gas.

A Yes.

Q In Alberta, don't you think that the City of Calgary as such would be interested in making the Turner Valley supply available for its domestic consumers?

A I would not doubt it.

Q DR. BOOMER: I would like to follow up Mr. Steer's question a little. You made the statement that there are about 20 wells in the Valley unable to meet the normal allowable that you would compute from Dr. Brown's formula. Can you give me any idea what the percentage of the total production in the Valley is attributed to those wells?

A No, but it is very small.

Q Have you any idea as to how fast the number of wells in that class will grow?

A No and I do not think that as far as I know that there is any data in your office to definitely indicate the rate of growth. The only thing I can give you is my own opinion.

Q That is all I am asking for.

A Well I think it will grow. As pressures drop it becomes fairly - it will accelerate in my view.

Q Can you express an opinion as to the ability of a well to produce gas, or to produce barrels per acre per day of reservoir fluid after the hole has been cleared of fluid, that is as compared to its ability to produce before it was cleared of fluid?

A It produces more after the well is cleared of fluid.

Q A well not producing 25 barrels per acre per day now because of fluid in the hole, it might produce much more if that fluid were not there.

A That is right.

Q Do you know if that is the experience?

A That is true. I know of some wells that you take the

fluid out and it will promptly give you higher pressures, that is recorded pressures on the surface, higher closed-in pressures and give you a very considerable increase in the volume of gas produced.

Q Is it true that wells in Turner Valley might, as they decline, become wells without any fluid in them?

A I have thought about that question a lot and it looked that way a few years ago that that was unquestionably what was going to happen. Then within recent years, we have had the reverse side coming and it is now quite clear that at the moment those older wells are bringing fluid into the hole. So there have been two tendencies shown by the actual historical records of the wells, One that they become drier and drier and drier and the other is the reverse.

Q Both kind of things happen today still?

A Beg pardon?

Q I say it is still true today that a well may become dry?

A Well it could happen, yes.

(Go to page 1040)

do with any possible extension of the Turner Valley field to the North.

At the bottom of page 822 he says this:

"Based on the present known proven area I consider it probable that 30 wells are likely to be drilled in the North field."

And on page 824, towards the bottom of the page, he says this:

"As is the case in the South field, there may very well be oil produced after 1952 but based on the presently known area and the present rate of decline of wells it is not likely that this yield will be substantial in quantity."

What I would like to make clear is that Mr. Davis did not make any reference to what was likely to happen in the way of production of oil by an extension of the field northward.

Then Mr. Chairman, Mr. Davis was to put in some additional material yesterday and I have here a copy of that map which was made exhibit 39, and if Mr. Davis would go in the box I will put in the other documents.

.....

Ralph E. Davis having been recalled examined by Mr. Steer testified as follows:

Q Mr. Davis, there was left open yesterday a question that you were to deal with and that is the variation in the gas-oil ratios and the rate of oil production and the gas

Q Whether or not a well becomes a dry well depends upon the way it has been operated prior to becoming a dry well?

A Well I would not like to say that because I think to me, - it seems to me to be more related to the permeability of the well itself and its little local location on the structure, that is in relation to its own local gas cap.

DR. BOOMER: I see.

THE CHAIRMAN: Anything further, thank you, Mr. Davies?

MR. CHAMBERS: Was Mr. Davies' report marked as an exhibit, if so I did not get the number of it.

THE CHAIRMAN: Exhibit 40.

MR. STEER: Mr. Chairman, before the next witness is called there is a matter to which I would like to refer. The lawyers engaged in this case find difficulty enough in understanding technicalities and I do not suppose anyone can blame the press reporter if he does not appreciate the full significance at times of what is said.

THE CHAIRMAN: That applies to 50% of the Board.

MR. STEER: There appeared in the press yesterday some reference to Mr. Davis' estimate as to oil production after 1952 and his statement, as reported, will cause some concern to operaters in the field who might be affected, and his evidence to which I would like to call attention, and perhaps our friends of the press might make the correction, -his evidence is found on pages 822 and 824, showing that Mr. Davis' estimatesare based on the present known proven area of the field and has nothing to

production, and you were to deal with that question, will you do so now?

A I have brought to the Board to-day graphs with a number of copies for distribution, which collect the application of the method of estimating future oil production in the South oil field on one sheet, the North oil field on the other, the method of estimating the gradual increases in gas-oil ratios in both the South and the North oil fields and the resulting estimate of gas production from the two oil field areas.

I think they are self-explanatory considered in connection with the testimony.

THE CHAIRMAN: The South oil field graph will be exhibit 41.

GRAPH PRODUCED HERE MARKED AS EXHIBIT 41.

THE CHAIRMAN: And the North oil field graph will be exhibit 42.

GRAPH PRODUCED HERE MARKED AS EXHIBIT 42.

Q MR. STEER: I think perhaps also I should refer you to an answer which you gave yesterday and you will tell me whether these graphs which you now file relate to this answer, it is at the bottom, at least starting about the middle of page 925, you say this:

> "Well if the production of oil in the South field is going to decline in the future in these six months periods at the rate of 15% with, compared to the previous six months, the conclusion which I did reach after studying the relation of oil production by the six-month periods, during the two or three

recent years that the Brown Plan had been in effect, that if the oil production were to decline at 15% and if the gas-oil ratio was to remain constant, then I would say that the gas production should decline at the same rate as the oil production in the six-month periods or about 30% for the year but in as much as the gas-oil ratio is constantly increasing then the interplay of those percentages would mean that although the oil production may decline at rather a constant percentage relationship, the gas production would decline at an accelerated rate."

Now having in mind that answer and your graphs, perhaps you will explain to the Board the purpose of the graphs?

A Regardless of the suitability or fundamental justification for the answer which I gave yesterday, disregarding that for the moment, I wish to say that these two graphs represent just what I did do in estimating the fut re gas production by time periods and taking, if you like, the South oil field, there is shown graphically the total oil production of the wells which had been completed prior to January 1, 1944 by monthly totals in a graph which starts about the middle of the left hand side of the page and declining in an irregular up and down line until we reach the month of August 1944. That was the last month that data was available. Now the estimated future represented on the graph by a dashed line extending downward to the right, was drawn on the calculated

Basis that the decline would continue in the future at a 15% rate of decline for any six-month period as compared to the proceding six-month period, a relationship which I had determined from the rate of decline during the previous months as plotted on this graph and particularly since the Brown Plan had come into operation.

The second line on the chart which I now refer to, the lower one on the left hand side of the page, shows the gas-oil ratio of these same wells. All of this data is taken from the Conservation Board's figures and we will note that in 1941 it was going up close to, the gas-oil ratio, there, near the left hand side of the page, just about a half an inch in from the left hand side, you will notice the figures begin, zero, 2, 4,6 and you will notice in December 1941 the gas-oil ratio of those wells was very close to six thousand feet per barrel, just under that, that would be about 5.8 thousand feet per barrel, and that ratio then declined to less than 4 thousand feet per barrel in the first or second month in 1943. From that time on till August 1944 there was a very uniform increase in the gas-oil ratio; in other words, the line followed a fairly straight upward trend to the right and not knowing better than to extrapolate that line as a straight line for the future, that is what I did, so that my anticipated production for any future time period such as, let us say 1947, I would look on the oil curve for the middle of the year 1947 and leave the oil production 100 thousand barrels; for the gas-oil ratio I would look to my second chart which I have described and find that to be 8 thousand feet per barrel and by multiplying the number of barrels by the number

of thousand feet per barrel, or the reverse of that, I would have the estimated quantity of gas to be produced in that time period. These points are as I have stated, monthly totals so that 100 thousand is not for the whole year 1947, it is for the middle month of 1947, either June or July.

If that explanation of the graph is sufficient I will turn now to the North oil field and say that --

Q DR. BOOMER: Where do you divide the North and South oil fields?

A I stated that yesterday, it is in my report, I think the South field includes everything up to and including Township 19 and the North field represents down to and including Township 20. That was a somewhat arbitrary line of division.

Q Yes, I just wanted that?

THE WITNESS: By the North field the method pursued was as in the case of the South field but here we have a field under active development so that you will note the production figures for the, - of oil, - in the first year 1941,we are of course dealing with the wells completed prior to the first of the year 1941 and those wells coming in caused a sharp rise in the following time period. If no further drilling were to be pursued in the field we would have the curve where it starts say at the end of 1942, where that oil line has ended in December 1942, but we have the complications of continued drilling as reflected in this graph, and that brings us to a decline which in this case, instead of computed on the

basis of 15% for six months is on the basis of 20%, a relationship which has been worked out and which is recorded in my report.

The gas-oil ratio graph is shown here. The estimated gas production by monthly periods is shown in the graph extending from the upper part of the page down right to the right.

(Go to page 1047)

Mr. R. E. Davis,
Exam. by Mr. Steer.

A These lines end at the year 1950 only because the paper ends there.

Q Now then you were to get some figures on the Bow Island reserve at the present time ?

MR. HARVIE: Excuse me. Would those lines continue right on ?

A The gas-oil ratio line would extend onward to the right hand upward as a straight line. The lower curve, the oil production curve would extend onward, not as a right straight line although very closely approximate.

Q Just on that same curve ?

A On a modest curve and that would bring about a modest curve in the estimated total gas production.

You asked me, Mr. Steer, about Bow Island. The gas that has been placed in storage at Bow Island, net production placed in storage is approximately 12 billion cubic feet.

Q MR. STEER: Have you any knowledge of what was there prior to the introduction of that ?

A There is complete information regarding the pressure of the field from the period of its early development down through the years. The gas withdrawn was known. The pressures determined annually and I would like to refer to my data. I think the pressure had reached a low point of about 250 pounds. After withdrawals from that field the pressure did drop to slightly less than 200 pounds but when the field was shut in, not drawn on, and before any gas had been taken back as storage in the field, pressures had built up to about 250 pounds. Now that build up of pressures we now know was due first to

equalization of pressure in sand and only partially to that. Very probably that was the lesser of the two causes. The Bow Island field is subject to a water drive and the area of the field is now known to be substantially less than it was found to be originally. Probably not more than two-thirds of its original area in size. Water has encroached around the field I believe on all sides as indicated by the drowning out of wells around the perimeter. So the question is how much gas was left in the field prior to the introduction of gas taken from Turner Valley. I think that the amount of gas left in the field was doubtless of the order of something less than two-sevenths of the original contents. Something less than that, because we had about 200 pounds pressure as compared with 750 pounds original pressure. Something less than twenty seventy-fifths and the total withdrawals amounted to about 38 billion feet, so that the total gas remaining would be of the order of 10 billion feet or less than that and when I say less than that because water encroachment had tended to hold that pressure up to about 200 pounds. I think 8 billion feet would have been a fair estimate. Now that gas could not be considered as available, only a portion of it. I think something of the order of 3 or 4 billion feet could reasonably be expected to be recovered now or any time in the past fifteen years from the original reserves. Add that to the gas that has been stored and I think we have a reserve in Bow Island of not less than 15 billion cubic feet.

Mr. R. E. Davis,
Cr.Exam. by Mr. Blanchard

Q MR. BLANCHARD: I have not had an opportunity of looking into the graph, but I would like to ask a question as to the ability of the wells in Bow Island field to produce daily. That is the daily capacity to produce, to meet peak load requirements.

A My information is gained from my contacts with the operating department of the Gas Company. I have not been to the Bow Island field in a good many years. Well I am advised, and I think Mr. P. D. Mellon, the General Superintendent, recently stated that Bow Island would be good for about 20 million feet per day. That would not be for continuous full winter delivery, but on a given sudden call could take 20 million and I think over a period of about a month something like 15 million per day.

Q It could be produced to 20 million per day ?

A Up to 20 million.

Q And that field is only produced for peak load requirements ? That is at present.

A That is right. That reserve has been held intact so far as it has been possible and it has been possible to hold practically the entire stored reserve.

Q I am a little ignorant about this perhaps, is there a reserve also at Foremost ?

A Yes sir.

Q Available ?

A Yes sir. I was wondering if you would ask about it.

Q And what is the daily capacity of the Foremost field ?

A I will not state that because I am not so familiar with it.

Q Well we can get that information ?

A Yes, however as to the reserves. I thought you might like to know that the reserves we believe are not less than 11 billion, probably not more than 15 billion and the difference in the two figures would in our estimation depend upon the pressure of abandonment. In other words, if you could take the gas out to a final abandonment pressure of 100 pounds we think we would get 15 or 16 billion cubic feet.

Q To 100 pounds ?

A But if the abandonment pressure be some two or three or four hundred pounds, then the total recovery would grade downward to probably about 11 billion cubic feet.

Q When you are speaking of pressures, you are speaking of rock pressure, or bottom hole pressure ?

A I am speaking of top of well pressures.

Q Top of hole pressures. What you term rock pressure ?

A You and my grandfather.

Q And at the present you say the rock pressure in the Bow Island field is 200 pounds ?

A I beg your pardon ?

Q At present the rock pressure is 250 pounds in the Bow Island field ?

A Oh today, the rock pressure at Bow Island is much more. The pressure had declined to a little under 200, had built back to about 250 before gas was introduced from Turner Valley. The introduction of that gas from Turner Valley built that pressure back to pretty close to 600 pounds, 550. You have the graph there but it is about 550 today sir.

Mr. R. E. Davis,
Cr.Exam. by Mr. Blanchard.

Q Thank you very much. And the present rock pressure in Foremost ?

A I believe that is about 700 pounds - it is around 570 now.

Q And do you anticipate that the wells in the Bow Island field can be produced down to 100 pounds bottom hole pressure ?

A I think that is quite probable.

Q And the same in the Foremost field ?

A I am not so sure about Foremost. We had the experience of seeing Bow Island operate for a number of years and we know that the sand is very, very permeable and that when the pressure at the bottom of the well is 100 pounds it won't be much more than 100 pounds back half a mile from that well because of the high permeability. If we had a similar high permeability in certain other fields I would have more confidence in withdrawing the gas to an average bottom hole pressure of about 100 pounds.

Q At what pressure does the gas enter the main line, do you know ?

A At Bow Island ?

Q Yes.

A Well they have a compressor station there.

Q Yes I wonder what it had to be compressed at ?

A At the present time that would not be necessary. They can feed the line with pressures up to 300 pounds without using the compressors and as the gas might be withdrawn and pressure drawn down to 100 pounds or in the gathering lines something less than 100 pounds

they still -

Q But they still have the compressors ?

A Yes.

Q MR. STEER: At the bottom of page 786 you are asked this question. It has to do with this question of rock pressure. "Mr. Harvie: Excuse me, you do use rock pressure then as bottom hole pressure do you ?" And your answer as reported is "The term rock pressure has that meaning in the natural gas world."

A I am sorry I did not hear what Mr. Harvie asked.

Q He said, do you use rock pressure as bottom hole pressure. Now there is a confusion in either the question or in the answer.

MR. HARVIE: I thought I asked the top hole pressure.

MR. STEER: I think that is exactly what occurred.

A Well in any case if Mr. Harvie's question could be made to ask if I used the term rock pressure as equivalent to top of well closed pressure, then I will say that is the meaning.

MR. BLANCHARD: I understand that the figures as to daily capacity of the Foremost field will be produced.

MR. STEER: Yes we will.

A There was one other question brought up. The question I think of Mr. Blanchard. You asked if it would be possible or convenient to work out something with regard to the possible or reasonably expected profits

of the gasoline plant as a result of this conservation program.

MR. BLANCHARD: I do not think I put that question to you.

THE CHAIRMAN: Yes, I did, Mr. Davis. I asked you if you could evaluate the benefits.

A The question was asked and I said I thought I could do that and you asked me, will you do it, and I said I would proceed to. Now I would not expect to do that you know without a reasonable time. Glad to do it. If the study be a worthy one information would tend to make it so. That at the moment is not available to me. I would like to have from the gasoline plant operators information regarding their costs of operation in a recent year, such as 1943 or the year 1944. That is the common background for such a study. Well I have no desire to ask for it other than to serve the purpose which I now have in mind.

THE CHAIRMAN: I will release you from your promise, Mr. Davis, in the meantime.

A All right.

GORDON ALAN CONNELL, having been duly sworn,

EXAMINED by Mr. Chambers.

MR. CHAMBERS: For the purposes of the record, possibly I should say that this witness Gordon Alan Connell is called on behalf of Royalite Oil Company and the Madison Natural Gas Company Limited to give his evidence merely for the information of the Commission.

Q Mr. Connell, you are a petroleum Engineer ?

Mr. G. A. Connell,
Exam. by Mr. Chambers.

A That is correct.

Q And you are employed with ?

A The Royalite Oil Company.

Q Now in order that we may have on the records something of your qualifications, I would like to ask you about your University training. You were graduated from the University of Alberta in what year ?

A 1937, Bachelor of Science degree in Chemical Engineering.

Q When you left the University where did you go ?

A I first started to work for the Petroleum and Natural Gas division in the Department of Lands and Mines in October 1937.

Q That would be of the Province of Alberta ?

A That is correct.

Q And while you were in that position what were the general nature of your duties ?

A General statistical work to start with, some examination of geological data and in February 1938 I went to Turner Valley where I assisted Mr. Goodall in collecting information regarding the Valley and in also making production tests for the purpose ofthe proration scheme that was then in effect.

(Go to Page 1055)

Q MR. CHAMBERS: And you were with the Conservation Board until when?

A I started with the Conservation Board on July 1st, 1938, and continued with them until June 1st, 1941.

Q And until 1941, June 1st, your duties with the Board were in connection with Turner Valley?

A Chiefly with Turner Valley. I did have a small amount of work to do with the wild cat wells in the Province.

Q And then you joined the Royalite Oil Company Limited in June 1941?

A That is correct.

Q And would you just detail briefly your duties from the time you joined the Royalite Oil Company?

A My main work was bringing in wells and supervising the operation of producing wells. We also have a certain amount of work to do with the drilling program, that is to say, casing programs and in the drilling.

Q And you are stationed in Turner Valley?

A Yes, that is correct.

Q And your chief duties are in connection with the Turner Valley operations of Royalite?

A Yes, that is correct.

Q Do you have anything to do with any of the other operations of the Royalite or its allied companies in the West?

A Since January 1943 I have been on mostly production tests in the Southern Alberta plains for Imperial Oil Producing Department.

Q That pretty well covers an outline of your duties?

A That is right.

Q Now, Mr. Connell, you have prepared or had prepared this map, and I think probably we should have the map put in, but not the frame, and marked as an exhibit.

MAP IN QUESTION WAS THEN MARKED AS EXHIBIT 43.

A I might explain that I was not responsible for the structural contour of the map itself. It was prepared by our geologists.

Q Mr. Connell, for the purpose of the record, would you tell us just briefly what this map is supposed to be?

A The lines on this map here represent the elevation from the top of the limestone as estimated by our geologists, and these areas are mapped out here in different colours. The yellow I considered in my report to be the gas cap area in the Turner Valley. The pink is the crude oil area, and the blue is the edge water. Across that part in yellow is an orange cross-section and that is the area that was converted from crude oil to gas cap in January 1943. At that time 10 wells were reclassified from crude oil wells to gas cap wells.

Q When you refer to the cross-section just what do you mean?

A Such as the Mercury well, West Flank, Monarch, Westside and Brown in here. (Indicating).

Q And that is shown in a little deeper yellow.

A Yes.

Q Now, Mr.Connell, you have also prepared a report dealing with the subject of gas reserves in Turner Valley?

A That is right.

Q I would offer that as the next exhibit.

THE CHAIRMAN: Exhibit 44.

SUBMISSION OF GORDON A. CONNELL OF LIMESTONE GAS RESERVES IN TURNER VALLEY MARKED EXHIBIT 44.

Q MR. CHAMBERS: Mr.Connell, would you just outline briefly the method that you have followed? You have heard the other witnesses describe the various methods of computing or estimating reserves, and you have heard the methods that they adopted. Please just tell us in a word or two what you have done?

A In the gas cap I chose to use the pressure drop volumetric method similar to that outlined by Dr. Katz. Howeverm in the case of the crude oil area, I have used the production decline curves, and using those production decline curves I have extrapolated to determine what production we might expect from these wells in the future.

Q Now, Mr.Connell, the first nine pages of your report or narrative, would you please read them, and make any comments that you may see fit to make as you go along?

A <u>Geology and Structure of Turner Valley.</u>

The Turner Valley structure is a highly faulted, closely folded anticline situated on the Eastern edge of the foothills belt about 20 miles from the

front range of the Rocky Mountains and 30 miles Southwest of the City of Calgary. Practically all of the oil and gas production is obtained from two dolomitic porous zones in the Mississippian (Rundle) limestone. Total depths of the producing limestone wells vary from 3792 feet at Royalite 14 to 9612 feet at North End Pete 1.

The Royalite 14 is situated in Turner town itself, and the North End Pete 1 is up in the North end, Northwest of the town of Millarville.

The crest on the East xide of the structure contains a gas cap approximately 15 miles long and one mile in width.

That is shown in yellow on that map.

The limits of the gas cap are based on the Conservation Board's definition of a gas cap well, namely, that any well having a gas-oil ratio greater than 30,000 cubic feet per barrel is classified as a gas cap well. However, for the purpose of these estimates, ten wells, that is B. & B. 1, Brown 1, Firestone 1, Foundation 1, Mercury Royalties 1, Monarch 1, Okalta 7, Westflank 2, Westflank 3 and Westside 1, which were transferred from oil well to gas cap well classification in January 1943, have been included with the crude oil wells.

I might add there that in making my final estimate I eliminated Okalta 7 because it has been abandoned, and B. & B. 1 which had its allowable transferred to Three Point. In the central area, West of Delhousie 7, that is in this area through here (indicating) where

there are insufficient wells to give adequate control, the limit of the gas cap has been set at approximately the 1700 feet below sea level contour of the top of the limestone. This gas cap area has 96 wells capable of producing.

In the last two months Miracle 3 production has been abandoned so that should read 95 wells.

THE CHAIRMAN: Would you mind, Mr.Connell, when you are referring to the map, to speak out because it is hard for us to hear and it must be difficult for the reporter to get it.

A Yes.

The area, excluding the ten wells which had their classification changed from oil wells to gas cap wells in January 1943, is approximately 8100 acres.

The crude oil area west of and down the dip from the gas cap is approximately 22 miles long and varies from 1 to 1¾ miles in width. As of January 1, 1945, there were 262 wells capable of producing.

That included Okalta 16 which had a fishing job and B. & B. which was transferred, whose alloweble was transferred to Three Point, and Home-Millarville 18 where they were waiting for casing to shut off the upper limestone. The approximate area of the crude oil well area is 17000 acres. I might say that includes 10 wells that were transferred from crude classification to gas cap classification. The Western limit of the oil area is fairly well defined by water wells. Command 2 is at present the shallowest well producing edge water. That is Command 2 up here. (Indicating).

THE CHAIRMAN: Just mention where it is, Mr.Connell, so that we will have it on the record.

A It is located in Section 29, Township 18, Range 2, West of the 5th.

Q MR. CHAMBERS: Yes.

A The top of the limestone at that well was encountered at 3424 feet below sea level. However, the water intrusion is probably due to coning.

Q What do you mean by "coning"?

A That is to say, there has been production from the area to the East of that for quite a considerable period of time and that water has been drawn in due to the lowering of pressure in that area. Water was encountered in Pacific Pete 6 where the top of the limestone elevation is 3890 feet below sea level..

Q THE CHAIRMAN: Coning is like a funnel of water going into the formation?

A That is right. Just to show it here, Commoil here is considerably deeper than Command 2 (Indicating) and the last information I had it started to produce water.

Q MR. CHAMBERS: How far is Commoil from the other well that you mentioned?

A Commoil is in the local subdivision North and West of Command 2. Pacific Pete 6 is located in Section 7, Township 19, Range 4 West of the 5th.

This is the shallowest well to encounter a water intrusion immediately after completion. The top of the limestone at other wells, where

water was encountered immediately after completion, was deeper than 4000 feet below sea level.

Gas Reserves of Crude Oil wells.

The wet gas reserves for the crude oil wells in Turner Valley are estimated at 290 billion cubic feet as of January 1, 1944, if, after January 1, 1945, the wells are:

A. Produced down to an operating tubing pressure of 75 pounds to the square inch, or,

B. Produced down to an oil production rate of 10 barrels per day in the cases of wells where the production rate is greater than 10 barrels per day at an operating tubing pressure of 75 pounds per square inch.

Q Mr.Connell, would you pause there for a moment. This 75 pounds tubing pressure, is that the same as rock pressure or top hole pressure?

A No, it is an operating pressure. Practically all the wells in Turner Valley, that is, the crude oil wells are produced through tubing pressure and that would be the pressure at the top of the hole.

(Go to page 1062)

An operating tubing pressure of 75 pounds per square inch was considered to be the minimum pressure at which a well could be operated and produce into any of the existing gas gathering systems other than the British American low pressure system. An oil production rate of 10 barrels per day has been considered to be the economic limit of an oil well.

If,after January 1, 1945, all crude oil wells were to be produced down to an oil production rate of 10 bbls per day, irrespective of the operating tubing pressure, the wet gas reserves, as of January 1, 1944 are estimated at 187 billion cubic feet.

I might explain that that statement after January 1, 1945 was put in because the 1944 production has already taken place and although there were some wells produced below 10 bbls per well per day in 1944 all the 1944 production was included in this estimate. That is to say that production is past history.

These estimates should not be confused with the economic marketable reserves, or the total amount of gas that will be produced. A number of wells will be abandoned before the limits outlined above are reached.

The operating tubing pressure at a number of wells will be too low to operate against the gas gathering line pressures. Lease fuel, gas for pull downs and blowdowns, shrinkage in passing through the absorption plants and plant fuel all will have to be deducted.

Q MR. CHAMBERS: What is the difference between a pull down and a blowdown?

A As a general rule we consider a pull down is when a well is pulled down through the separators or through the flares while a blowdown is when a well is blocked down and the separator is by-passed and all production goes straight out to the flare.

The wet gas reserves from the gas cap wells in Turner Valley down to a bottom hole pressure of 100 pounds per sq. in. are estimated at 301 billion cubic feet, as of January 1, 1944. However it is probable that it will not be economical to produce all gas cap wells down to a bottom hole pressure of 100 lbs. per sq, in.

That point will be developed in Mr. Stevens-Guille's estimate of the amount of gas that it is economical to recover and the exact amount of gas gathering line pressure will be a factor in that and also the capacity of the wells to produce will be a second factor in determining whether it be economical to gather that gas.

Total Gas Reserves of Crude Oilwells and Gas Cap Wells. The following is a summary of the estimated wet gas production to the limits as specified below in areas served by the two Madison compressor stations, the Gas and Oil Products Plant and the British American plant, as of January 1, 1944 as shown in Table Nos. 11A, 11B, and VIII:

Compressor Station or Plant	Crude Oilwell Gas to 75 lbs per sq. in. or 10 bbls per day MMMcf	Gas Cap Gas to 100 lbs per sq. in. BHP MMMcf	Total MMMcf
Madison Compressor Station #1	176	239	415
Madison Compressor Station #3	43	4	47
Gas and Oil Products Plant	27	27	54
British American Plant	44	31	75
Total	290	301	591

Compressor Station or Plant	Crude Oilwel Gas to 10 bbls per day MMMcf	Gas Cap Gas to 100 lbs per sq. in. BHP MMMcf	Total MMMcf
Madison Compressor Station #1	106	239	345
Madison Compressor Station #3	33	4	37
Gas and Oil Products Plant	20	27	47
British American Plant	28	31	59
Total	187	301	488

Here I have set up tables showing the breakdown of both crude oil well gas and the gas cap gas to the four different areas, that is to say Madison Compressor Station No. 1, Madison Compressor Station No. 3, Gas and Oil Products plant and the British American plant. From this it is seen that the total for the crude oil wells gas to 75 lbs per sq. in. per day is 290 billion and the gas cap is 301 billion. In the second table where

it was considered that the wells would not be produced below 10 bbls per well per day the gas production from the crude oil well was estimated as 187 billion cubic feet as of January 1, 1944 and the gas cap remained unchanged.

Q Mr. Connell, going back to that first table, it shows crude oil well gas to 75 lbs per sq. in. pressure or 10 bbls per day. I take it that that estimate is for the later of those two events.

A Whichever happens the later of the two, that is corredt.

Method Used in Estimating Gas Reserves of Crude Oilwells.

In order to determine the amount of gas available to any system of gas gathering lines, it is necessary to estimate:

(1) The amount of gas that could be produced down to specified pressure or economic limits from individual wells or groups of wells,

(2) The rate at which this gas will be produced from individual wells or groups of wells,

(3) The operating pressure at which this gas would be available,

(4) The gas gathering line pressure.

Owing to the low permeability of the limestone formation in the crude oil area in Turner Valley and the length of time (that might vary anywhere from a few days to a month) required to obtain true reservoir pressures, it has been common practice on the majority of the wells to take bottom hole pressures following a 24-hour shut-in

period. I might say that is chiefly for basing the allowables. From results obtained at wells where reservoir build-up tests have been taken, it is apparent that reservoir pressures estimated from 24-hour shut-in pressures would be unreliable. As the decrease in reservoir pressure for a measured withdrawal is one of the main factors in making estimates by volumetric methods, it is apparent that the volumetric method of estimating does not lend itself to practical application in the Turner Valley crude oil area. If the volumetric method were used, the probable rate of production and the pressure, at which the gas from individual wells or groups of wells would be available, would still have to be estimated.

When decline curves are used the actual performance of the well is used as the basis of the estimates. The performance is a function of reservoir factors, such as porosity, permeability, reservoir pressure, etc. The main objection to the use of the decline curves is during periods when the withdrawal is subjected to drastic changes, such as the Turner Valley field was subjected to when the seasonal market demand was the governing factor in proration. This objection has been eliminated with the introduction of the Brown Plan, under which allowables are based on reservoir withdrawals and not on market demand. The Brown Plan became fully effective for the wells North of Sheep Creek on July 1, 1942 and for the wells South of Sheep Creek on September 1, 1942.

Under reasonably uniform operating conditions

a decline curve of production rate vs. time should be nearly a straight line on semi-logarithmic paper.

In order to estimate the amount of gas, the rate of gas and oil production and the pressure at which the gas would be available, the average daily gas and oil production rates and the average tubing pressures for each crude oilwell in the field were plotted for each month from January 1942 to the latest data available at the time the graphs were plotted.

Four sets of these graphs will be supplied to the Natural Gas Utilities Board.

MR. CHAMBERS: . Do you wish to put those in as part of the report or as a separate exhibit, sir?

THE CHAIRMAN: They had better be put in as a separate exhibit.

MR. CHAMBERS: Then you had better offer those now.

A Four copies were delivered to the Board. These are the originals.

GRAPH NOW MARKED EXHIBIT 45.

Q I wonder, for the purpose of the record, Mr. Connell, if you would tell us what this Exhibit 45 is.

A For each producing crude oil well in Turner Valley, we calculated the average daily gas production; the average daily oil production and the average tubing pressure for each month starting January 1942. For the Royalite operated wells, we started from the time the wells were completed except for the gas and tubing

pressures.

Q This Exhibit 45 consists of the graph based on that data?

A That is correct. It also shows an extrapolation that I have estimated from the data available in order to determine what production and what pressure at which the gas might be available in the future.

In the case of most wells, after a certain "adjusting" period, following the time that the Brown Plan became fully effective, the trend of decline in the rate of gas production is fairly well defined. However, some wells show no decline rate and others actually show an increase. However, as the bottom hole pressures decline at these wells the allowable will be decreased and the gas production will, in the near future, show a decline. That is to say we cannot expect these wells to keep increasing in the gas production rates. Therefore a decline rate, less than those of surrounding wells was placed on these wells. My reason for doing that is that we just did not know the exact time when these wells would start to show a decline, so that they might possibly keep increasing for a while and then start to decline. Therefore the average decline rate should be less than those of the surrounding wells. Decline rates of completed wells on which a fair amount of data has been obtained were used as a basis for declining the production rates of new wells or wells to be completed, which, it is estimated, should have similar production characteristics to those of the old wells.

The initial production rates of the wells to be completed were estimated as lower than the initial production rates of the old wells as the reservoir pressure will have declined somewhat by the time the new wells are completed.

That may not be exactly a correct assumption but I think that is reasonable, that the new wells should be, that is in the same area, should have similar characteristics as the wells which have already been completed in that area, unless there is something wrong and if so my estimate would have to be changed for the difference the new wells vary from the old wells.

In declining the operating tubing pressures of wells where no decline rates were apparent or where the tubing pressures were increasing and for wells recently completed or to be completed, a practice similar to that outlined above for the gas production decline rates was followed. The decline rates for the tubing pressure in wells where bottom hole chokes have been installed since the introduction of the Brown Plan, were based on the pressures prior to installing the choke, as these chokes are removable. Installing a choke in a well is to control the production and it is usually installed in the bottom of the tubing and represents a restriction and naturally will decrease the operating tubing pressure at the top of the well.

Wells close to the gas cap tend to have a fairly low decline rate in the operating tubing pressure, as a number of these wells are stopcocked to obtain a lower gas-oil ratio than would be obtained by operating

steadily against a higher tubing pressure. Some wells on the west flank which have already started to produce water and other wells close to the edge water have shown a sharp decline in their operating tubing pressures. Good examples of this are Anglo-Canadian 7, Extension 2, Northwest Hudson's Bay 8, Royalite 43 and Royalite 47. For this reason tubing pressures of wells which are in close proximity to the edge water have been declined at a rapid rate.

Decline curves were also drawn for the average daily oil production rate of each well. From these curves, it will be noted that during the first year to 18 months, for a considerable percentage of new wells, the decline rate usually is quite rapid, then the decline rate decreases. However, where wells show a rapid increase in gas-oil ratio, the decline rate tends to increase.

As an illustration of that I might mention North-West Hudson's Bay 6 which shows a break in the decline rate in the oil production and due to the rapid increase in ratio the oil production rate has declined.

In making these estimates, an attempt has been made to use the decline rates determined from the actual performance of the wells, unless, in my opinion, other factors justified changing these rates. Undoubtedly, the gas production or tubing pressures for individual wells will vary from the estimates given, some will be higher and others will be lower, but may average out to give the same total reserves. It will be necessary to review these estimates periodically, and, if necessary, make adjustments, based on the additional information obtained.

In Table 1 are given the estimates of the daily average gas production from individual wells down to an operating tubing pressure of 75 pounds per square inch, or, in the case of wells where the oil production rate is greater than 10 barrels per day at an operating pressure of 75 pounds per square inch, the estimates were made down to an oil production rate of 10 barrels per day. Estimated tubing pressures are given starting at the time when the tubing pressure approaches the present gathering line pressure in the area in which the wells are situated.

That is to say, it was not necessary to show tubing pressures so long as I estimated the well above the present gas-gathering line pressure because it can get into the line at the present pressure and in the future those pressures will be reduced. Estimates of oil production are given from the time the oil production rate declines to about 20 barrels per day.

The only reason for putting that oil production rate in was to give some information and possibly obtain some idea of the economic limit of the well as an oil well or as an oil and gas well.

Table IIA on page 52, is a summary, by areas, of the estimated gas production given in Table 1.

Perhaps I might refer to that Table designated Table IIA.

Q MR. CHAMBERS: That is on page 52?

A Page 52.

In this table I have summarized the estimates of gas production by the plants or compressor

Stations for each year starting in 1944, that is to say in 1944 the daily average gas in the Madison compressor station that I estimated could be produced in the Madison compressor station No.1 was 40,189 M.C.F.

There is one point here that I should clear up. I have shown in my estimate these figures, the closest M.C.F., I do not mean to infer by that that these estimates are that accurate.

Q MR. CHAMBERS: Mr. Connell, when you refer to the Madison Compressor Plant or Station, that is the production from the area?

A That is the production from the area.

Q Not necessary the physical plant?

A That is the production from the area served by these plants. That gas will not necessarily be produced into the gas-gathering lines of these plants or compressor stations and on that page I have also shown the field total; the average for 1944 I have estimated 83,103 thousand cubic feet per day.

Table IIB is a summary, by areas, of the estimated gas production considering that the crude oil wells would be abandoned when the average oil production rate decreases to below 10 barrels per day, after January 1st, 1945.

That is a similar table, only the cut-off is there made when the average production for the year, as I have estimated, becomes less than 10 barrels per well per day. If the average production rate was IO barrels per well per day I left it in there but if it was 9 barrels, it was cut out.

In Table III is given a list of the estimated locations to be completed after October 15th, 1944, together with the estimated initial gas and oil production rates and completion dates. In this estimate, four wells were estimated to be completed by June 1, 1945, by the Home Millarville interests. However, at the time of the writing of this report (February 5th, 1945) no wells have been started by that Company and no information was available with regard to their drilling program.

That Company now has two locations in the North end of the field, neither one of them is the same as I have estimated, but the wells in Table III were the ones which I used for the purposes of my estimate and it does not necessarily mean that the companies will drill there and it does not even necessarily mean that our own Company will drill in the locations shown because that will have to be developed according to information obtained from present drilling wells but if those wells are not drilled the estimate will have to be reduced by that amount. However in some cases there will be wells drilled in different locations to those I have indicated and it may offset the estimate for the wells which will not be drilled.

If these wells are drilled, the gas will be produced at a later date than that shown. The location is Lsd. 16-2-20-3-W.5, shown for the Home-Millarville interest, may possibly be a Royalite-Lowery location.

THE CHAIRMAN: Monday morning at 9.30.

(The Inquiry was here adjourned to be resumed at 9.30 on Monday, March 26th, 1945).